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INTERNATIONAL FIRE FIGHTER

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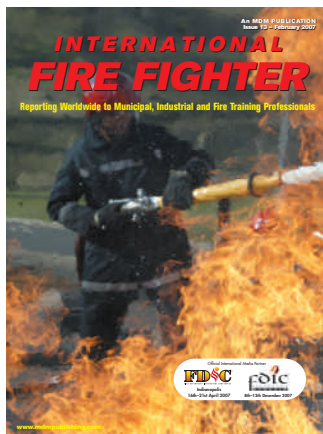
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INDUSTRIAL FIREFIGHTERS

February 2007 Issue 13



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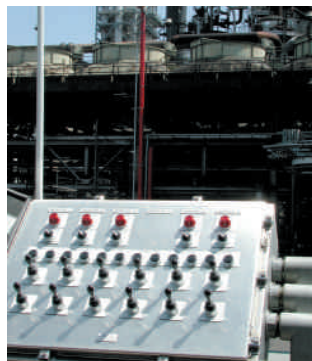
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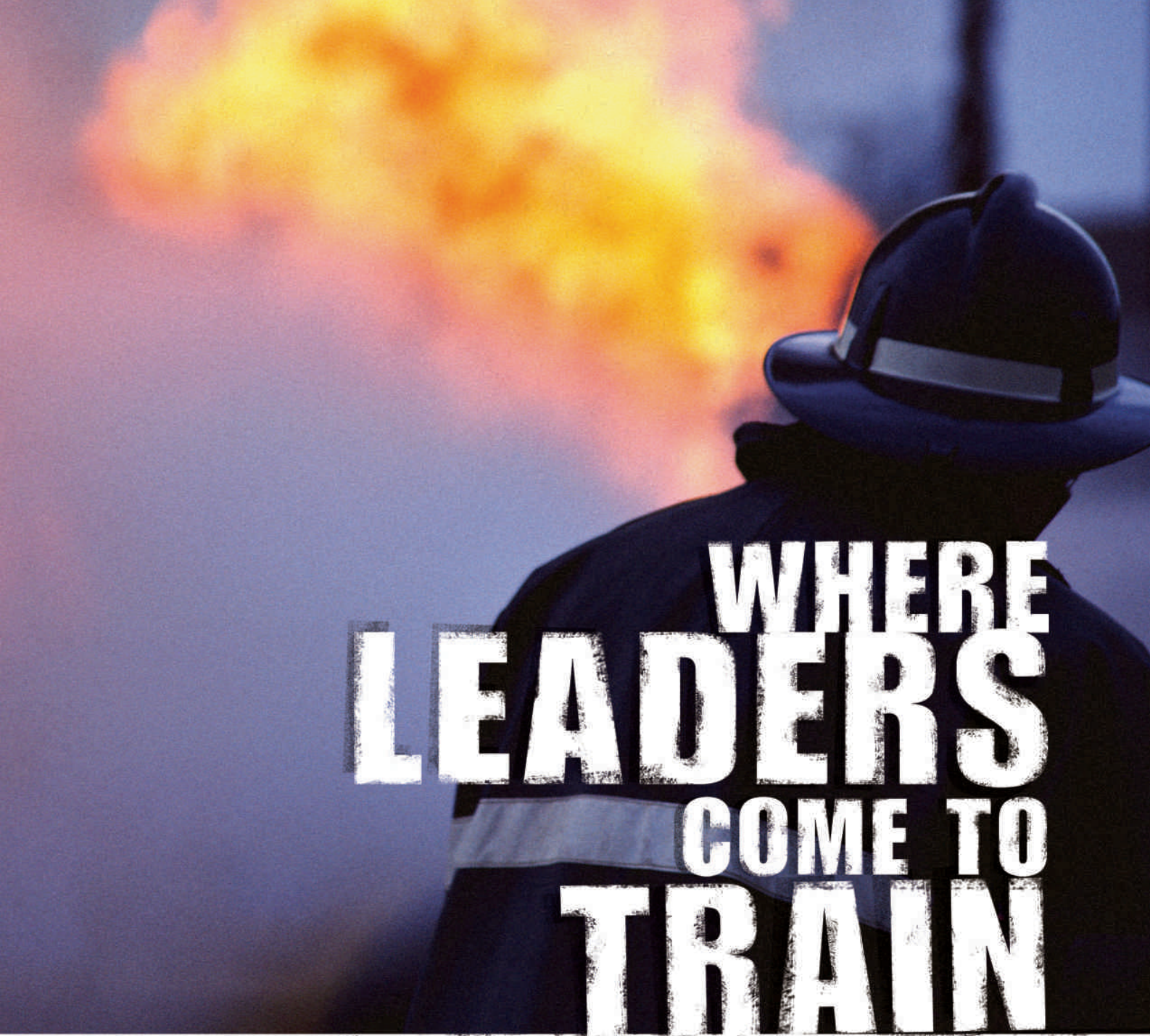
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New Foam Product will revolutionise Decontamination Theory and Practice in Europe



A FOAM product that will revolutionise decontamination theory and practice in Europe is being introduced from the US by Professional Protection Systems. Designated EasyDECON™ DF 2000 this new decontamination solution is capable of killing or neutralising a broad range of WMD contaminants. Also because of its unique chemical structure it can be used on practically anything from vehicles to whole buildings. A chemical and biological decontaminant it also kills mould as well as eliminating its smell.

EasyDECON™DF200 is particularly suitable for the decontamination of structures as it has the unique ability to adhere to vertical and inverted surfaces where it creates a foam blanket to maintain the required contact time between agent and the decontamination formulation. It has the added virtue of being non-corrosive and its use adds no environmental load to the clean-up operation. Kill time ranges from a few minutes to half an hour depending on agent and environmental conditions.

When used with application equipment designed by the US Intelagard company even coverage is achieved thus maximising contact time and suppressing any reaction from the agent being treated whilst decontamination takes place.

Whilst the Intelagard company are suppliers of EasyDECON™ and equipment for its application to the American military and Homeland Security amongst others PPS have won exclusive rights to the product in the UK, France, Spain, Germany, Japan and Italy all of whom are

major users of current PPS decontamination equipment.

The obvious major feature of this new system being offered by PPS is that it does not use water. According to Mark Whitcher, Managing Director of PPS, water has been at the core of all decontamination technologies until now. "Essentially what water does" he says "is move contaminant from one place to another. In small quantities water can be

contained and disposed of. With something the size of a vehicle you start to have problems and with a building it becomes just about impossible to use successfully. EasyDECON™ is the answer".

Various systems for the delivery of the foam are available, from a backpack to a large scale fixed site decontamination system.

A relatively small scale deployment apparatus, a backpack unit named the Macaw can be used for facilities protection at nuclear power plants, pharma companies, petro-chemical facilities and similar process operations as well as military installations. It has also developed a sport side being on hand at most US Grand Prix events.

The fixed site decontamination system on the other hand can undertake interior and exterior building decontamination, hazmat and fire response, cargo and infrastructure protection as well as decontamination at airports, runways, seaports and roads amongst other types of infrastructure.

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Helmet's International Sales Team



HELMET INTEGRATED SYSTEMS LTD (HISL) continue to develop their international sales, with an ongoing commitment to visiting their distributors and customers throughout the world, introducing and supporting their extensive product range.

Pictured at a recent Sales Meeting their experienced sales team are shown back row from left Andy Anderson, Barry Vincent, Bob Gaskell, Tony Rutter, Jamie Harper, Paul Corston and front row from left Stuart Redpath, Colin Robinson, Steve Skeggs and Jan Korny (Sales & Marketing Director)

Helmet's will be introducing new products to their fire and rescue helmet range in 2007 and will be showing their products at a number of major international exhibitions. It may not be widely known in the international fire market that HISL are one of the world's leading manufacturers of helmets for military and civil aircrew; an expertise that enables advances in materials and manufacturing technology, such as those being used to make the helmet unit for the Joint Strike Fighter (JSF), to extend out to their fire and rescue helmet range.

Further details can be obtained on their website www.helmets.co.uk

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Please register for access to our new website Sales and Service Zone www.helmets.co.uk

Unifire AB and Rosenbauer International AG announced as partners

Tokyo Bosai Setsubi Co., Ltd. (TBS) of Japan announces that it has selected Unifire AB of Sweden and Rosenbauer International AG of Austria as partners for its innovative automatic fire detection and extinguishing CAFS system. The system, created by TBS, combines a fire detection system, a redundant central computer command system, Unifire stainless steel Force series remote-controlled water/foam monitors, thermal (and optional optical) cameras mounted on each Force monitor, and the Rosenbauer Flash CAFS system for added fire extinguishing effectiveness.



In the event a fire is detected by the fire detection system, a signal is sent to the systems controlling computer indicating the fire's general location. The closest monitor (or monitors) then immediately begins scanning as the thermal imaging cameras locate and triangulate the exact position of the fire on an x, y, z coordinate system. The coordinates of the fire are fed back to the controlling computer, which then calculates the best trajectory and accordingly aims the monitors to cover the fire. The entirely mechanical Rosenbauer Flash CAFS system then begins discharging a compressed air foam solution through the monitors, directly onto the fire, without any external power supply. The monitor is preprogrammed to oscillate in a pattern most effective to cover the entire fire, and the nozzle is also programmed to effectively vary its spray pattern seamlessly between jet and spray. The parameters of the monitors' oscillation and the nozzles' spray pattern can be programmed to vary according to the size and location of the fire, and are fully adjustable to meet the customer's particular needs.

The system can rapidly extinguish fires and limits the spray to the specific area where the fire breaks out. It can deploy fully automatically or, if desired, either semi-automatically or manually with the operators' prior approval and/or intervention at any time. The system is designed to endure very harsh environments, including by use of the Unifire stainless steel 316 monitors, and it can be deployed in numerous environments such as tunnels, underground structures, refuse pits, oil tanks, parking garages, on the interior and exterior of buildings and warehouses, airport arrival halls, and in aircraft hangars, to name just a few.

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Angus Fire Selected as Exclusive Foam Provider



Left to Right: Andy Hawkes (J&RA Hawkes & Sons), Greg Richardson (Protection Technical Manager, SembCorp), Martin Hough (Sales Manager, Angus Fire).

ANGUS FIRE announced that it has won a major contract to supply SembCorp Utilities UK with Tridol ATF 1x3 fire fighting foam. Angus Fire is part of UTC Fire & Security, a unit of United Technologies Corp. (NYSE:UTX).

Based on Teesside in the North of England, SembCorp provides emergency response services to one of the highest concentrations of chemical plants and refineries in Europe. With access to the largest industrial foam stocks in the UK, it responds quickly and effectively to fires involving a range of different flammable liquids.

"This new partnership gives SembCorp access not only to the latest foam technology, but also to strong technical support. The logistics expertise of the Angus emergency service, which proved so effective at Buncefield, will also help us to source additional foam stocks when we need them urgently," said Greg Richardson, SembCorp's Protection Technical Manager.

Previously, SembCorp used a foam product from a different manufacturer. It had considerable post-fire clean-up costs due to an environmentally harmful ingredient called PFOS and has since been withdrawn from the market.

Angus Fire's Tridol ATF is a new generation PFOS-free foam that provides high fire fighting performance and is a 1x3 grade, which is more efficient to handle at incidents than 3x6 grade foams.

"SembCorp is leading the way for emergency response organisations that still stock PFOS-based foam. By acting in

advance of possible changes in environmental legislation that may prohibit its use at emergencies they are positioning themselves well for the future," said Martin Hough, Sales Manager for Angus Fire.

The new foam will be supplied by J&RA Hawkes & Sons, Angus Fire's authorised distributor in the North of England. Hawkes is also collecting the old stock and arranging for it to be disposed of by the required method of high temperature incineration, and arranging for the new foam stocks to be tested regularly to ensure that they remain uncontaminated and in good working condition.

Angus Fire is the largest foam manufacturer in the world, producing a complete range of environmentally responsible foams at its factory in Bentham, North Yorkshire. It also manufactures fire hose and fire equipment at Bentham, and provides product sales and customer support from Thame, near Oxford. Angus Fire is part of UTC Fire & Security, which provides fire safety and security solutions to more than one million customers throughout the world. UTC Fire & Security, headquartered in Connecticut, USA, is a business unit of United Technologies Corp., which provides high technology products and services to the building and aerospace industries worldwide.

For more information contact:
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Scott Eagle Thermal Imaging Cameras

Providing clear visual images that make the difference

Scott Health and Safety announce the launch of the latest range of thermal imaging cameras including the premier Eagle Imager® 160 and the compact and affordable Eagle X™. The lightweight thermal imaging cameras are extremely durable and have been developed to meet the demands of the toughest fire ground operations, ensuring total reliability and providing valuable infra-red detection for a variety of law enforcement, security and hazmat applications.

Eagle Imager® 160 has proven to be one of the most effective rugged tools available in the fight to combat fire. From search and rescue, to revealing fire extensions, the Eagle Imager® 160 thermal imaging camera provides accurate information with precise image interpretation to enable the user to quickly and efficiently assess fireground conditions and make calculated decisions.

Ergonomically versatile, a user-selectable handle position allows the camera to be used whilst standing or crawling or even hands free operation. The LCD-to-optics design is intended to help users maintain their orientation in dark and unfamiliar surroundings, and the large format viewing provides for optimal viewing by one or more.

At the heart of the Eagle Imager® 160 is the most advanced 160 x 120 vanadium oxide Firecooled™ microbolometer with a dynamic range of 600°C and a fast 60Hz update rate to provide for smooth, seamless images. The thermal imager is always ready for action with reliable extra long 3-hour service life batteries, a simple one way Twist-Change™ battery replacement, spare battery and truck mounted charging system.

The Scott Eagle X™ is amongst the



lightest weight hand-held thermal imager available (1.2kgs.) and is user-friendly camera designed for heat source identification. Simple to operate with a large 9cm viewing screen for maximum imaging, the Eagle X™ has provided invaluable fast-attack technology for a wide variety of first response applications. The camera features a sure-grip handle to provide a positive fit into a gloved hand and may be operated in an upright or side arm position, or can be inverted to view under objects.

The Eagle X design utilises the same proven technology as the Scott Eagle Imager 160 and offers all the must-have features in a thermal imaging camera – without numerous high-end options. Reliable and cost-effective, the Eagle X combines clear and crisp thermal imaging technology in a compact, reliable and affordable camera.

Further information on the complete range of Eagle thermal imaging cameras is available on request or visit www.scottint.com

New Cutters from TNT Rescue Systems, Inc.

TNT ANNOUNCES their new line of Auto Extrication Cutters, the SLC-24 and the SLC-27. These new cutters are designed specifically with the new car materials and designs in mind. Useable cut forces have been increased and the weight reduced. These new cutters boast over 118,000 lbs of USEABLE cut force while weighing in at less than 36 pounds. Our new advanced design also allows the tool to open and close in 22% less time than our standard cutter, while maintaining the ultimate in variable control. The SLC-27 blade



SLC-27 cutter

opening is 7.75" (196.9mm) and the SLC-24 opens 5.0" (127mm). Both tools are well balanced for easy operator use and offer our standard twist control valve. As with all TNT products the new cutters are covered by our comprehensive warranty, which includes coverage for blades and an extensive customer service network.



SLC-24 cutter

For more information, please contact:
TNT Rescue Systems
Tel: +1 920 474 4101
Fax: +1 920 474 4477
Email: email@tntrescue.com
Website: www.tntrescue.com



Fire & Rescue and International Fire Expo Events

Birmingham will witness the largest ever gathering of fire & rescue service professionals when the new event, Fire & Rescue takes place alongside the world-renowned fire protection event International Fire Expo at the NEC from 22-24 May 2007.



Run on behalf of the Chief Fire Officers Association (CFOA), The Institution of Fire Engineers (IFE) and The Fire Protection Association (FPA), Fire & Rescue 2007 will cater for the requirements of everyone within the Fire and Rescue Service, industrial brigades and other rescue organisations, and will focus on the key developments in this sector, including changes in legislation and the impact of modernisation.

Leading Suppliers & Informative Features

As well as appealing to senior fire officers, Fire & Rescue will provide all those involved in the operational and procurement aspects of the fire-fighting industry with a platform from which to source a variety of products and services and learn about the latest developments taking place within the industry. The event will offer a multitude of innovative attractions in the way of themed villages, an outdoor demonstration area and educational seminar theatres. Exhibiting companies will include leading suppliers, Trelleborg, Lion Apparel, Bristol Uniforms, Interspiro, Cosalt Ballyclare and The Fire Service College.

The Emergency Action Zone is where the very best in fire fighting and rescue equipment and techniques will be put to the test in a spectacular live display. This outdoor area will allow visitors to witness live demonstrations of the latest products in the market, many of them never seen before. In addition the outside area will feature the Fire Fighting Vehicle Manufacturers Association (FFVMA) Pavilion which will provide visitors with a chance to view a range of fire fighting vehicles exhibited by the market's leading vehicle manufacturers.

World-Class Conference

Running alongside the exhibition is the Fire & Rescue Conference 2007. This high profile conference programme will feature some of the industries most highly respected authorities and will be opened by the Rt Hon Ruth Kelly MP. Keynote addresses will be given by Lord Stevens, Chair of Strategy Advisory Panel, Interpol and Lord Bruce-Lockhart, LGA Chairman. Sessions to be

included in the three day programme include:

Designing For Diversity

Chaired by Tony McGuirk, CFO, Merseyside Fire & Rescue Service

Emergencies and Dealing with Climatic Change

Presented by Paul Hayden, CFO, Hereford & Worcester Fire & Rescue Service

Managing Fire Storm Tempest and Terror in the USA

Presented by David R Paulison, Under Secretary, FEMA, US Department of Homeland Security

Equality & Diversity

Presented by Waqar Azmi – Senior Advisor, Cabinet Office

US Volunteer Fire Fighters: Case Study

Presented by Philip Stittleburg – Chairman NVFC

Please note that all conference topics and presenters are subject to change. For further information on the conference including an up-to-date programme, please visit www.fireandrescue.com/conference.

Industry Celebration

During the evening of Tuesday 22 May 2007, The Fire Industry Awards will reward and acknowledge excellence, innovation and professionalism in fire safety engineering, product design, and fire and rescue practice. Presented during a gala dinner at the Hilton Metropole hotel in Birmingham, The Fire Industry Awards feature nine categories designed to reflect the rapid growth and broad remit of the fire industry.

For further information on the awards including the entry criteria and table bookings, please visit www.thefireshow.com.

Co-located with Fire and Rescue is the UK's largest fire industry event, International Fire Expo. Taking place from 21-24 May 2007, International Fire Expo is an event for those involved in fire prevention and protection to make the best buying decisions and network with over 170 of the industry's leading companies including Apollo Fire Detectors, C-Tec, Gent by Honeywell, Fullon, EMS Radio Fire & Security Systems, Hochiki, Siemens, Ventcroft, Klaxon and KAC. Both shows are part of the May Series of events that includes Safety and Health Expo, The Facilities Show and the leading global security event, IFSEC.

Entry to both Fire & Rescue and International Fire Expo is free. Register in advance at www.thefireshow.com where the latest event information, news and seminar timetables are available. **IFF**

Companies interested in exhibiting at either exhibition should contact:
Gerry Dunphy on
+44 (0)20 7921 8063 or
gdunphy@cmpi.biz

National Disabled Fire Association

The idea for creating a national network for disabled fire service employees came from Duncan White of Somerset Fire & Rescue Service. In 2002, as a career firefighter of some 15 years, Duncan discovered that his hearing was deteriorating and was subsequently diagnosed with a condition called Otosclerosis in addition to Noise Induced Hearing Loss.

Fearful of the implications of declaring his disability, Duncan did not immediately disclose his condition to the Fire Authority but set about to find a possible solution. Working closely with a local Hearing Aid Specialist and Access to Work he was able to present a favourable case to the Fire Authority who fully supported keeping him in an operational role rather than retire him on health grounds.

Recalling the isolation and concerns that he himself had experienced, Duncan resolved to turn

Fire Authorities have a duty to consider making “reasonable adjustments” to enable people to obtain or retain employment with the fire and rescue services.

his experience towards supporting others within the Fire Service who may be living with or affected by disability. With colleagues Barbara North and Andy Oaker from Devon Fire & Rescue Service, and supported by Michelle Valentine from the Disability Rights Commission, the vision of a National network was born.

Whilst the Disability Discrimination Act has been in operation since 1995, operational firefighters have only been covered since October 2004. Despite the excellent red book “Guidance to Fire & Rescue Service Managers”, produced by the Chief Fire Officers Association (CFOA) and the Disability Rights Commission (DRC), there are still many myths (and some true stories) surrounding the needs of firefighters who acquire a disability or potential employees with a disability. Fire Authorities have a duty to consider making “reasonable adjustments” to enable people to obtain or retain employment with the fire and rescue services.

Whilst every new case needs to be treated on an individual basis (there can never be a “one size fits all” approach) there will be generic issues and experiences that can be shared between disabled employees and their employers, through a network. We are currently seeing a number of “firsts” – the first amputee firefighter; the first retained firefighter with a heart valve replacement.

A network will enable us to set up a catalogue of generic risk assessments; look at the type of “reasonable adjustments” that have and can be made; provide support to individuals who must come to terms with their loss of capacity and, above all, identify the potential of a vast number of capable, valuable and skilful individuals who have so much to offer the modern fire and rescue service.

Some financial assistance has been offered by the Disability Rights Commission to help establish a network but sustainable financial backing is what is needed. Resources (such as dedicated human resources) to maintain and evolve the net-

We are currently seeing a number of “firsts” – the first amputee firefighter; the first retained firefighter with a heart valve replacement.

work, including a web site; sign up and buy in from stakeholders and partners and dedicated time to put together an appropriate business case. Duncan & Co currently have very full “day jobs” and it is just not feasible to incorporate this work as an add on. Working with partners such as CFOA, the Department of Communities and Local Government and the Local Government Association it is hoped that the network can be launched in 2007 to give much needed advice and support to both employees and employers.

IFF

If you feel that you have something to offer the network, please contact either:

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TFT introduces new remote BIV with industry's largest waterway

TFT's New Remote Controlled Jumbo Ball Intake Valve Breaks the Friction-Loss Barrier



TASK FORCE TIPS' new remote controlled Jumbo Ball Intake Valve (RC BIV) not only sets new standards with the industry's largest waterway, but it also breaks the friction loss barrier, giving up as little as 3 psi @ 2,000 gpm.

"The remote control cuts down on firefighters having to climb up and down the truck," said Rod Carringer, TFT's vice president for sales & marketing. "While the increased size allows a better match to your inlet, giving you a less restricted flow. It's a win/win design

development that lends itself to top-mount pumps, as well as trucks with larger (gpm) pumps."

Nearly a year in development, the newest member of TFT's RC (remote control) group sailed through prototype field trials. Using the top selling BIV with its 3 3/8 inch waterway as the industry's benchmark, mechanical engineers doubled the waterway size, while adding less than an inch in unit height and 1 1/2 inch in length.

"The 30° elbow swivels 360°, allowing hose connections from any direction with minimal kinks and coupling stress," Carringer explained. "It also has TFT's triple coating protection, meaning that it's been powder coated, poly impregnated and hardcoat anodized. Some think of that as overkill. But that protection is what allows all of our BIV's to work for years under extreme conditions.

"And I know that everyone has heard about, read about or bought other electronic devices that have trouble with corrosion and water impregnation," Carringer said. "At TFT, we have a track record of rugged dependability and innovation, as well as a full five-year warranty. TFT's design engineering group has gone to great lengths to assure an airtight seal. That, along with the triple coating, gives us an edge in design, quality, and durability."

The prewired RC unit is easy to install. "Basically, you hook two wires to your power supply," Carringer said. "Two buttons on the control panel operate the valve, and there's an LED display to show the position of the valve. Then there's 10 foot of wire between the BIV and the control box."

The unit ships in the "Manual Mode" cycle, where the operator has to press and hold the button to open or close the BIV. When switched to the "Automatic Mode," a momentary press of the button moves the unit into the open or shut position.

For apparatus with smaller (4" and 4 1/2") intake valves, TFT has two adapter rings that are featured in its new catalog.

For information about adapter rings, the BIV, the RC BIV, the Jumbo BIV, or the RC Jumbo BIV, tel. TFT at (800) 348 2686 or visit TFT's website at www.tft.com

Unifire Force™ series monitors selected

UNIFIRE AB (www.unifire.com) announces that Crash Rescue Equipment Services, Inc. has selected the Unifire Force™ series



monitors for their aviation and industrial fire fighting products. The first application has been on the new 65 ft. (19 meter) aerial water tower – Snozzle®. Two Snozzle models

have been designed: Hydra-Sword for municipal and industrial fire apparatus and Model 652 for Aircraft Rescue Fire Fighting (ARFF) vehicles. These aerial devices are unique in that they have two monitors, each operating at different levels. At the tip of the Snozzle, the Unifire Force50™ flows up to 500 gpm (1900 lpm) and can be maneuvered into small openings for interior fire fighting. The base nozzle, the Unifire Force80™, flows up to 1500 gpm (5,600 lpm). The stainless steel 316 construction of the Unifire Force monitors makes them light weight, highly resistant to corrosion,

extremely durable, and ideal for the foam agent's discharged through the nozzle. Also, the unique proportional speed control of the Force monitor's movement adds a new level of precise control for these large master streams. The program feature of the Force monitors allows the operator to record a range of motion as well as spray pattern and then have the monitor and nozzle repeat the sequence indefinitely. This is ideal for protecting exposures. Unifire also offers its Force monitors with an optional progressive radio remote control, allowing the operator to precisely control the monitors while away from the vehicle. The Force monitors' control system utilizes CANBUS technology, which makes installation simple, reduces wiring requirements, and allows for custom controls not only of the monitor and nozzle, but also of additional devices.

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New Speedings Cylinder Covers

Revolutionary to ensure Compliance



SPEEDINGS LTD, the UK's largest manufacturer of compressed air cylinder covers, has developed a revolutionary 'zipped cylinder cover' for use with breathing apparatus sets. Following consultation with fire and rescue services around the UK, Speedings were tasked with providing a cover that could be easily removed, by one person, to allow the cylinder to be inspected prior to being refilled.

BS EN 1920:2000 *Transportable gas cylinders* placed a requirement for all cylinders that were designed for compressed gases to be inspected prior to refilling. The requirement is designed to ensure that the cylinder:

- Has no defects that would render the cylinder unsafe for filling or continued use
- Complies with the relevant requirements regarding marking, labeling and colour coding
- Has a complete set of accessories
- Valve function satisfactorily

The standard (non-zipped) Speedings cylinder cover was designed to be tight fitting to ensure that there was no unnecessary movement between cylinder and cover. Whilst ensuring an extremely tight fit they were not designed to be taken on and off regularly. The need to take the cylinder cover off prior to refilling meant the task of removing the non-zipped cylinder covers became onerous and time consuming – not to mention tedious and the fact that the process required two people to achieve the task as the covers were that tight fitting.

To ensure that that the process was easily achievable, the research and development department at Speedings set about experimenting with various methods of securing the cylinder cover onto the cylinder. The solution was to use a high quality heat resistant zip that not only provided the high degree of security required but also ensured that the tight fit between cylinder and cover was maintained.

Robert Hammal, Production Director at Speedings said, "We relished the challenge handed down to us by the UK Fire and Rescue Services to design and manufacture a cylinder cover that would meet the needs of the Service for the next decade and beyond. The new covers are being used extensively throughout the Service and we continue to offer the full range of

New large Transport Cases Range by Peli™

COMBINING BIG space with big convenience, Peli™ Products, a leading manufacturer of high-impact watertight Protector™ Cases and professional torches, is proud to announce the launch of a range of three Transport Cases: 1630, 1640 and 1690.



1630 Internal dimensions:
70.3 x 53.3 x 39.4 (cm)
External dimensions:
79.4 x 61.5 x 44.4 (cm)

This new range is perfect for safely transporting just about anything (including larger sensitive electronics). Ergonomic features include two extra-wide, side-grips for double hand lifting, as well as two heavy-duty sets of ball-bearing, polyurethane wheels and an extension handle for easy transport.

Like all Peli Protector Cases, the Transport Cases cell-core construction protects



1640 Internal dimensions:
60.2 x 60.9 x 35.3 (cm)
External dimensions:
69.09 x 69.8 x 41.4 (cm)

additional extras that were available on the traditional covers – it is reassuring to know that firefighter safety is being further protected by the ability for them to inspect their cylinders regularly. The process is now a single person operation."

The Speedings zipped cylinder covers are certainly the first choice for Fire and Rescue Services in the UK and the company will be demonstrating their complete product range at FDIC Indianapolis, USA in April and at Fire and

sensitive equipment against extreme conditions, rough handling, dust and water. You will know it's a Peli Case by its distinctive "Dual Band" top surface and the automatic Gore-TEX® pressure equalization valve, which stops moisture from entering the case and prevents vacuum-lock so the case opens easily at any altitude.



1690 Internal dimensions:
76.2 x 63.5 x 40.7 (cm)
External dimensions:
84.7 x 72.2 x 46.3 (cm)

The 1630, 1640 and 1690

Transport Cases also offer stainless steel reinforced padlock protectors for added security against cutting and theft. Lid organizers, utility padded divider sets and TSA Accepted PeliLock are available. These cases are the perfect solution for transporting sensitive equipment, for companies handling warranty returns of large electronics, and for shipping inside trade show booth containers.

As with all Peli products, these new cases are covered under Peli's Unconditional Guarantee:

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Peli Products, S.A.
Tel: +34 93 467 4999
Email: marisa@peli.com
Website: www.peli.com

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- Camping Equipment

Rescue, NEC Birmingham in May. Please drop onto the stand and compare the covers, it will soon become obvious that Speedings have got the future of Cylinder Covers all zipped up!!

For more information:
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Fax: +44 (0) 191 523 9955
Email: speedingsltd@btconnect.com
Website: www.speedingsltd.co.uk



The Fire Safety Engineering College

Unique British Education

The Fire Safety Engineering College is a unique Higher Education Institution in the Sultanate of Oman founded in 1997. The College is regulated by the Ministry of Higher Education in Oman and is affiliated with The University of Central Lancashire, one of the largest universities in the UK, and which has a history dating back to 1828. This affiliation agreement provides the highest level of quality assurance in its Higher Education programmes and is reinforced by compliance with the British Governments' Quality Assurance Agency.

FSEC Academic Programs

Diploma of Higher Education in Fire Safety Engineering

Leading to –

BSc (Hons) Fire Safety
BSc (Hons) Fire Safety Management

BEng (Hons) Fire Engineering

Diploma of Higher Education in Well Engineering

Leading to –

B.Eng (Hons) Mechanical Engineering

Diploma of Higher Education in Facilities Management

Leading to –

BSc (Hons) Facilities Management

For further information on courses available, please contact:

Fire Safety Engineering College

PO Box 2511
PC 111 Seeb

Sultanate of Oman

Tel: +968 24521256

Fax: +968 24521042

Email: info@fsecoman.com

Website: www.fsecoman.com

The Fire Safety Engineering College provides the following unique academic programmes:

- Diploma of Higher Education in Well Engineering
- Diploma of Higher Education in Fire Safety Engineering
- Diploma of Higher Education in Facilities Management

The College's Higher Education programmes attract both young and mature students from many different countries in the region, and students on these programmes have the opportunity of mixing with experienced industry professionals attending short courses at the College.

The College brings together the best staff, teaching resources and purpose-built facilities for fire safety, oil and gas drilling and buildings and facilities management training and education within the Gulf region, and offers both higher education programmes and vocational training for industry to international standards. The College's relationship with industry through its vocational training activities helps to ensure that the vocational elements of its higher education programmes remain relevant and current.

At present the college has 1000 full time Higher Education students and offers training for 5,000 professionals every year from different industries and countries. The college offers around 100 short and mid-duration courses, ranging from basic fire fighting to command and management.

The College is a voting member in the following Organisations:

The International Fire Service Accreditation Congress (IFSAC) USA

The Fire Safety Engineering College is an important member in the Middle East and is a voting member of both the Certificate (Vocational) and Degree assemblies. The college is accredited by IFSAC to deliver NFPA 1001 Firefighter 1 and 2 plus other NFPA programmes.

The Civil Aviation Authority (CAA) UK

The College's aviation courses have been inspected by the Civil Aviation Authority (CAA) International Services Department and continuously monitored by them.

International Well Control Forum (IWCF) UK

The Fire Safety Engineering College is an associate member of the IWCF and is an accredited centre for the provision of Well Control courses, tests and examinations.

International Association of Drilling Contractors (IADC) UK

The Fire Safety Engineering College is an associate member of the IADC.

American Safety & Health Institute

The Fire Safety Engineering College has recently received official accreditation from the American Safety and Health Institute as a basic life support training centre at the awareness and first responder levels.

FSEC Vocational Course Offerings

The Fire Safety Engineering College offers the following internationally recognized and accredited courses in its Vocational programme:

- Aviation Fire-Fighting
- Fire & Rescue (Aviation & Industrial)
- Risk & Safety Management
- Life Support Training
- Stuck Pipe Prevention
- IWCF Certification
- Nebosh Accredited International General Certificate in Occupational Safety & Health
- IOSH Accredited Managing Safely in Construction
- Construction Safety Management
- Nebosh Accredited International Diploma in Occupational Safety & Health Practice
- IOSH Accredited Managing Safely
- American Safety & Health Courses (ASHI)

Task Force Tips' New Jumbo BIV provides big water relief



TASK FORCE TIPS' new Jumbo BIV marries the industry's largest ball intake valve waterway with the industry's toughest coatings, producing a corrosion resistant valve that delivers huge water with loss of only 3 psi @ 2,000 gpm.

"We can't keep these jumbo valves on the shelves," said TFT's Vice President of Sales and Marketing Rod Carringer, pointing to a group of new Jumbo BIVs being prepared to ship. "I guess word got out from our field testing, because people started calling for them even before our new catalog came out."

The new Jumbo BIV's 5½ inch waterway is the answer to repeated requests for higher flows from customers who swear by TFT's top selling BIV – a unit that features a standard 3½ inch waterway. Although engineers nearly doubled the standard waterway size, they added less than an inch in unit height and 1½ inch in length.

"We've triple coated the BIV ever since it was introduced back in 2002," Carringer said. "Not only do we rely on our unique poly-impregnation process, but we also hard coat anodize AND powder coat finish them for additional protection against harsh environments. Then we used stainless steel components on the valve's wet side, as an extra layer of protection. If that doesn't convince you, remember that the Jumbo BIV's backed by TFT's remarkable five-year product guarantee."

The new Jumbo BIV's 30° elbow swivels 360°, allowing hose connections from any direction with minimal kinks and coupling stress. It also has a unique position indicator that lets the operator know if the valve is opened, closed or somewhere in between. Its hand wheel, which can be installed on either the left or right side, takes a full 7¼ turns to close, meeting NFPA slow-close requirements.

"All of which may sound like overkill. But that protection from corrosion is what allows TFT's BIVs to work under the most extreme conditions. Because, after all, firefighters work under extreme conditions every day," Carringer said. "This may be a new product, but it has the same TFT quality that people worldwide have grown accustomed to buying. Not to mention our 24 hour service line, which we've had for years, because most firefighters don't just work from nine to five."

For those with 4" or 4½" intake threads on their pump, TFT has two adapter rings that are featured in its new catalog.

For information about adapter rings, the BIV, the RC BIV, the Jumbo BIV, or the RC Jumbo BIV, phone TFT at (800) 348 – 2686 or visit TFT's website at www.tft.com

Skum protection for high risk environments

PROVIDING THE right combination of firefighting agent and delivery system has led to Tyco Fire & Security's Skum brand – which is Swedish for foam – being recognised globally as the industry's leading provider of dependable and efficient fire protection solutions for high value, high risk petrochemical, aviation, marine and power plant applications.

The company designs and manufactures sophisticated foam-based extinguishing systems and equipment to safeguard installations where a fire has the potential to have catastrophic economic, environmental or life-threatening consequences. In addition to developing innovative foam solutions, such as the Skum HotFoam high-expansion foam system that is designed for use in enclosed spaces, the company is also at the leading edge when it comes to foam delivery systems and engineering.

Skum's sophisticated fixed or mobile delivery systems do away with the need for the massive and urgent deployment of equipment and firefighting personnel. They also ensure that a fire is responded to in the shortest possible time, so reducing the potential for the fire to develop into a major incident. Skum was the first company to supply a semi-subsurface system for storage tank protection and this and other Skum systems are today in use throughout the world providing around-the-clock protection for oil, LNG and other flammable liquid storage tanks and bunds.

The company also has an array of fixed foam generators and fixed monitors that can cost effectively protect storage tanks and associated spill or ground fires. It also manufactures portable monitors and trailers that can be quickly and easily deployed. These are used extensively by municipal and industrial fire brigades and professional firefighters.

The Skum systems are noted for such characteristics as long throw capability and fast knock down. Many incorporate features not readily found on other systems on the market, such as electric remote control of monitors rather than the more common reliance on hydraulic power, and the use of materials that are more resistant to corrosion, particularly in marine or harsh industrial environments. Several of the Skum water or foam monitors, which now span from 500lpm to 25,000lpm, are less than half the weight of some competitors' comparable models.



Further details on Skum solutions and expertise can be found at www.skum.com, or are obtainable by email on info@skum.com, by telephone on +31 71 5419415, or by fax on +31 71 5417330.

Elkhart Brass Opens Enhanced Testing Center



7500 Square Foot Testing Facility Result of Product-line and Company Growth

CONTINUING A commitment to providing the safest and highest quality products in the market, Elkhart Brass is proud to announce the opening of an expanded, state-of-the-art test facility in their Elkhart, Indiana headquarters.

"Our new testing facility not only helps ensure we deliver the best and safest waterflow products, but also allows us to continue to design, develop and manufacture innovative solutions and get them to the market faster. The new Uni-body Valve is a perfect example of this improved design-to-

build execution process," stated Don Sjolín, Marketing Director for Elkhart Brass.

The test facility is the first of its kind in the industry and is an expansion of 7500 square feet to the current test center. The new expansion includes a 2400 square foot testing booth with over 30 yards of concrete creating a 50 ton back-splash. The center includes a 20,000 gallon holding/re-circulating tank feeding a CMU 2-stage Waterous Pump.

"R&D is critical for us to continue to be an innovator in waterflow equipment. The new test facility positions us to keep innovating for years to come," stated Don Sjolín.

The new test center is live and operational and can be toured during visits to Elkhart Brass' headquarters.

About Elkhart Brass

Elkhart Brass Mfg. Co., Inc. is a leading manufacturer of firefighting equipment. They have been owned and operated by the same family since they were founded in 1902. In addition to apparatus valves, Elkhart Brass manufactures monitors, nozzles, fireground appliances, foam eductors, apparatus fittings, and accessories for many of these components.

Contact details:

Don Sjolín, Elkhart Brass, Inc., P.O. Box 1127 - Elkhart, IN 46515

Tel: (800) 346-0250 ext. 235 Fax: (574) 293-9914

Email: dsjolin@elkhartbrass.com Website: www.elkhartbrass.com

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Health & Safety*



Improving Health & Safety of Respiratory Protection While Improving Catastrophic Incident Command:

The Dynamic Equipment Supplier's Role

In rising to the challenge of the UK Governments Office of the Deputy Prime Minister- National Procurement Strategy for the Fire and Rescue Service: 2005-2008 and the subsequent new FiReBuy Ltd structure now established to drive change within the procurement functions of the British Fire and Rescue Services' (FRS). Fire and Rescue Service Equipment suppliers now really need to appreciate and understand that not only have the 'goal posts' moved in their market but equally they have changed shape and format and will continue to do so as the new demands of 'servicing' the developing twenty first century responses to disasters evolve.

By Geoff Williams
QFSM, ChFI,
CIETecRI, MIFireE

President of the
International Emergency
Technical Response
Institute (iETRI),
European, Middle East,
Africa and Australasia Fire
Sales Manager for SCOTT
Health & Safety Ltd.

Thirty years ago no one could have foreseen the new threats that emergency responding agencies would be now facing and having to respond to in 2006. Planes full of passengers being purposely flown into buildings. Chemical and germ warfare being instigated against civilian populations. One earthquake causing a tsunami which would cause death and destruction in countries thousands of miles apart and finally bombs being placed on Underground transportation systems with intent to kill anyone regardless of colour, race, faith or age.

Within this new threatening environment, new government legislation was rapidly required to try and prepare all emergency services to combat and challenge these new threats to our civilians. The Civil Contingency Act(s) of England, Wales, Northern Ireland and Scotland (CAA) has gone a long way to ensure that all agencies who respond during a crisis are now correctly organised, prepared and able to meet whatever human or natural induced disaster they may encounter.

Within this new framework of the CCA however, the role of many individual emergency agencies

Pic courtesy of Scott Health & Safety



equipment suppliers, whom they regularly purchase from on a daily basis, have no predefined role during a major or catastrophic incident. At first glance, it appears as though the private industry has no responsibility other than a moral one to assist their customers in their time of greatest need. It is also inconceivable to suggest that governments should try (or have the capability), to become involved and *efficiently* enforce and manage the private sector of emergency service suppliers during a disaster. It is therefore left to the responding agencies responsibility to make arrangements to pre-see out their best suppliers to ensure they will be there when they're most needed. Again, no responsibility is placed upon the suppliers within this kind of 'customer-supplier partnership' approach, it is predominantly one sided and it's the customer, i.e. the FRS who is left with all the responsibility to make all the arrangements and pre-planning. The imbalance of these relationships needs quickly addressing.

Within the new procurement standards, equipment suppliers should be asking themselves "How can we really help our customers in their difficult tasks and how can we really become a reliable supporting player during their times of crisis?" Now is the prudent time for both sides, i.e. FRS and their current and potentially new equipment suppliers to be discussing what practical systems can be provided to ensure that during a major incident, if required, further equipment and services will be available from their supplier within certain agreed timescales and within predefined weights of response. In simple terms, FRS should be asking very probing questions of their current and prospective suppliers *before* sending out invitations to tender for their business. It is argued therefore that the national procurement strategy should include such criterion and be used as

leverage towards ensuring equipment suppliers can and will deliver to the UK FRS during emergencies.

Thankfully, one leading FRS equipment supplier has already identified this imbalance of responsibility and already commenced establishing methods and protocols to assist their customers during these events. Draft Memorandums of Understanding and inclusion within FRS Standard Operational Procedures are now being considered as part of the new service they will deliver to their customers. The 're-thinking and analysing' all of their business relationships and support mechanisms during national or international disaster incidents is well underway.

Since the 9/11 (and now the UK Equivalent 7/7), they have seen a paradigm shift on their business capabilities to one which must assist their customers during any crisis. It cannot be over emphasised that this is no easy task and that many dangers will be encountered by equipment suppliers during attendance at such incidents. Any equipment supplier who thinks they can pay 'lip service' in meeting such new specifications in undertaking these new responsibilities to their customers will soon be found out. Accurate training and procedures need to be pre-planned and prepared for before any major event occurs.

The events at the Twin Towers proved how one major problem at such catastrophic incidents needs to be effectively managed, i.e. the maintaining of a safe respiratory environment for the emergency services to operate in. Rethinking strategies and tactics for respiratory equipment suppliers' roles at catastrophic operations is therefore one excellent example of the type of functions equipment suppliers will need to address.

SCOTT Health and Safety Ltd have already taken these steps and are currently reviewing a

draft discussion document which identifies '12 Key Factors' of an operational framework in which it is proposed they should be able to provide to their customers during an emergency. It is titled:

"The Development of Respiratory Protection for Improving Catastrophic Incident Command – The Dynamic Equipment Suppliers Role" This is to be launched at the Intersec Conference in Dubai in January 2007.

In this worst case scenario where the environment of a city has been transformed into an 'urban canyon' stage, e.g. Ground Zero in New York. SCOTT Health and Safety as the departments chosen respiratory protection providers to the Fire Department of New York learned many lessons which are now bearing fruition for all Fire and Rescue Services world wide.

During the events of 9/11, they commenced a rapid response logistical support operation which transported extra breathing apparatus sets and other such types of respiratory protection equipment and services to designated locations at the incident site.

Subsequently in the aftermath debriefing of the disaster, lessons were learned between their customer and supplier relationship. As a consequence of this they have now developed their relationship and working practises to meet even higher levels of service provision quality. SCOTT H & S now manage all FDNY self contained breathing apparatus requirements. On Randal Island at the FDNY Training Academy they have established the 'SCOTT Air Service Center' which now maintains all the Departments Self Contained Breathing Apparatus (SCBA) sets, Thermal Image Camera maintenance and repairs and SCBA radio communications, etc. This out sourcing of these vital servicing requirements has allowed FDNY to concentrate and focus their efforts on other vital operational matters safe in the knowledge that this specific part of their corporate risk is being excellently managed and maintained by their 'true-and equal partners –SCOTT'.

In conclusion, as part of this new approach to analysing the 'Real' needs of a FRS when they are either considering renewing or transferring their

SCBA contracts. SCOTT Health and Safety Ltd has raised the bar in what levels of service the emergency services can expect from a SCBA supplier. A breathing apparatus set is no longer a 'simple commodity' on which purchase will solely be decided by the lowest common denominator, namely that of price.

FRS Strategic Management teams will now be able to make really accurate purchasing decisions based upon what true quality service levels will be provided by SCBA equipment suppliers. As one SCOTT distributor said: *"Fire and Rescue Services now have a real opportunity to reduce or even totally remove a big part of their corporate risk"*.

These new opportunities now being presented to FRS have to be fully understood by all those equipment suppliers who are now attempting to sell their specific products and services.

The Chief Fire and Rescue Service management teams now have genuine opportunities to vastly improve and 'Add Measurable Value' to their current performance levels and enter into true and equal partnerships with their SCBA suppliers. Today's risk stakes are too high for any FRS leaders to now simply buy on lowest price alone. Equipment suppliers who basically think that they will always close a deal based on them having the lowest price alone are in for a rude awakening. *'Equipment suppliers now really need to appreciate and understand that not only have the 'goal posts' moved in their market but equally they have changed shape and format'* As the old saying states:

"The bitterness of poor quality remains long after the sweetness of low price is forgotten."

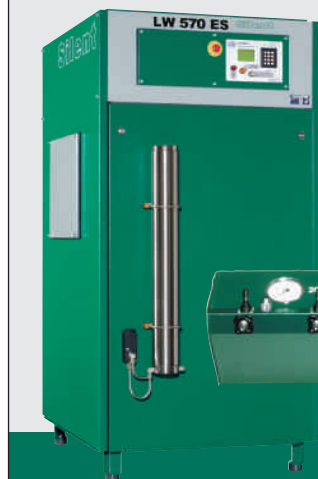
These new quality and service standards established by SCOTT have now been raised to meet new customer expectation levels – only those innovative equipment suppliers who can attain them will survive!

The warnings are therefore clear – with responsibilities comes opportunities but the old ways of selling will no longer suffice, *the customer-supplier relationship imbalances must be rectified, the new challenges must now be met.*

IFF

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fire&rescue

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- **Showcase your products and services to an unrivalled international audience**, and have the chance to demonstrate them in the Emergency Action Zone.
- **Access to over 50,000* professionals** - The co-location with International Fire Expo, IFSEC, Safety & Health Expo and the Facilities Show gives you access to individuals spanning the entire spectrum of fire fighting and prevention, safety, security and facilities management industries.

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Contact Ana Monteiro on +44 (0) 207 921 8342 to confirm your involvement or visit

www.fireandrescueexpo.com

Wildland/Urban Firefighting

By The Bureau of
Land Management

A wildland-urban interface exists where community-defined values, structures, watersheds, roads and highways, power and gas lines, or other community resources intermingle with wildland fuels, and may be threatened by wildland fires. Wildland fires in these areas are often multi-jurisdictional and multi-agency. This complexity combined with wildland fire, public safety, increased media attention, political pressures, and other factors, may combine to overwhelm a normal size-up and decision-making process. The potential exists in areas of wildland/urban interface for extremely dangerous and complex fire burning conditions.

Policy

The operational roles of the agencies in the wildland/urban interface are wildland firefighting, hazardous fuels reduction, cooperative prevention and education, and technical assistance. Structural fire suppression is the responsibility of tribal, state, or local governments. Federal agencies may assist with exterior structural protection activities under formal Fire Protection Agreements that specify the mutual responsibilities of the partners, including funding.

Protection Agreements and Planning

Managers must incorporate wildland/urban interface considerations into all agreements, operating plans, and land and fire management plans, to ensure that all interface areas are covered and state and local responsibilities are apportioned appropriately.

BLM

- Bureau of Land Management (BLM) resources will not be planned, nor dispatched, as a normal response for structure or vehicle fires, except in those cases where these fires pose a significant threat to BLM administered lands. In these situa-

No BLM employee will respond to a structure or vehicle fire prior to receiving required training in hazard awareness and unique safety considerations associated with structure and vehicle protection.

tions, resources should only be used in wildland protection. Actions will be limited to the exterior of the structure or vehicle unless there is an immediate threat to human life.

- No BLM employee will respond to a structure or vehicle fire prior to receiving required training in hazard awareness and unique safety considerations associated with structure and vehicle

protection. A local fire department with responsibility for structure and vehicle fire protection may provide this training.

- BLM employees, in interagency dispatch centers, should not provide dispatch services for cooperating agencies with structure fire, vehicle fire, or emergency medical responsibility, unless (1) a current interagency agreement is in effect, (2) BLM personnel have been trained in local

BLM employees will be acting as agents of that agency and will only communicate information contained in that agency's dispatch plan or as directed by an official from that agency.

emergency dispatch procedures, and (3) the BLM employee has a delegation of authority for those activities outside the normal scope of the BLM. In these instances, BLM employees will be acting as agents of that agency and will only communicate information contained in that agency's dispatch plan or as directed by an official from that agency.

- The minimum hose diameter for vehicle fires is 1.5 inches when using foam in wildland/urban interface and vehicle fire situations.

FWS

- Structural firefighting is not our functional responsibility. We should only perform assistance in structure protection on an emergency basis to save lives. Our fire personnel may assist in protecting wildlands around structures or protecting the structure's exterior from approaching fire when we can accomplish such action safely. We will make our fire personnel aware of safety hazards associated with suppression activities around structures and transportation systems.
- Do not knowingly place employees in a position where exposure to noxious gases or chemicals

- or other situations require the use of self-contained breathing apparatus.
- Cooperative agreements will not commit our personnel to structural fire suppression.

NPS

The NPS has structural fire suppression authority and responsibilities on lands it administers. Only personnel with proper training and equipment will be assigned interior structure suppression duties, per DO-58. NPS wildland firefighters without the required structural training, PPE, and equipment are limited to exterior or exposure protection of buildings in wildland fire situations.

NPS – Vehicle Fire Response Requirements for Wildland Firefighters

Vehicle fires including single-passenger vehicles are common types of fires encountered by firefighters. These fires contain a high level of toxic emissions

**If firefighters are directed,
dispatched, (including self-
dispatching) to structural fires,
including vehicle fires, they
must be provided with the
required personal protective
equipment, firefighting
equipment and training.**

and must be treated with the same care that structural fires are treated. Firefighters must be in full structural fire personal protective clothing including self-contained breathing apparatus. Situations exist during the incipient phase of a vehicle fire where the fire can be quickly suppressed with the discharge of a handheld fire extinguisher. Discharging a handheld fire extinguisher during this phase of the fire will normally be considered an appropriate action. If the fire has gone beyond the incipient stage, employees are to protect the scene and request the appropriate suppression resources.

If firefighters are directed, dispatched, (including self-dispatching) to structural fires, including vehicle fires, they must be provided with the required personal protective equipment, firefighting equipment and training. In order to protect the health and safety of National Park Service personnel, no employee shall be directed, dispatched, (including self-dispatching) to the suppression of vehicle fires unless they meet or exceed the following standards and regulations. The use of personal protective equipment and self-contained breathing apparatus are governed by adherence with the following Director's Orders, standards and regulations:

- Directors Order #58, Structural Fire
- NFPA 472 (1997) – Standard on Professional Competence of Responders to Hazardous Materials Incidents
- NFPA 1001 (1997) – Standard for Firefighter Professional Qualifications
- NFPA 1971 (2000) – Standard on Fire Protective Ensemble for Structural Fire Fighting

- NFPA 1404 (1996) – Fire Department Self-Contained Breathing Apparatus Program
- NFPA 1500 (1997) – Fire Department Occupational Safety and Health Program
- 29 CFR 1910 & 1926 (Respiratory Protection Final Rule) and OSHA 29 CFR 1910.134 (Respiratory Protection)

Training. Firefighters being dispatched to suppression of vehicle fires require:

- Compliance with OSHA 29 CFR 1910.134 (This information is taught in Unit 5 of the structural fire training course and will require approximately 3 hours).
- Compliance with NFPA 1971 Standard on Protective Ensemble for Structural Fire Fighting (This information is taught in Unit 4 of the structural fire training course and will require approximately 1 hour).
- Documented instruction by a certified fire instructor on the strategy, tactics and safety requirements in suppression activities related to vehicle fire suppression. This training does not include rescue and extrication. (This information is taught in Unit 19 of the structural fire training course and will require approximately 3 hours).

Funding of the training required to suppress vehicle fires should be provided by the benefiting accounts.

Medical examinations. Medical Requirements for Fire Fighters (NFPA 1582). Medical requirements include respiratory testing and some other components not included in the wildland fire medical examination.

Physical fitness. Same as National Park Service wildland fire requirements for arduous duty.

USFS

FSM-5137 – Structure Fires. Structure fire protection activities include suppression of wildfires that are threatening improvements. Exterior structure protection measures include actions such

**The Forest Service may
assist state and local fire
departments in exterior
structure fire protection
when requested under
terms of an approved
cooperative agreement.**

as foam or water application to exterior surfaces of buildings and surrounding fuels, fuel removal, and burning out around buildings.

FSM-5137.1 – Structure Fire Protection From Advancing Wildfires. The Forest Service's primary responsibility is to suppress wildfire before it reaches structures. The Forest Service may assist state and local fire departments in exterior structure fire protection when requested under terms of an approved cooperative agreement.

FSM-5137.2 – Structure Fire Suppression. Structure fire suppression, which includes exterior and interior actions on burning structures, is the

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responsibility of state, tribal, or local fire departments. Forest Service officials shall avoid giving the appearance that the agency is prepared to serve as a structure fire suppression organization. Forest Service employees shall limit fire suppression actions to exterior structure protection measures as described in *Section 5137*.

FSM-5137.3 – Structure Fire Protection and Suppression for Forest

Service Facilities. At those Forest Service administrative sites, outside the jurisdiction of state and local fire departments, limit fire protection measures to prevention, use of fire extinguishers on incipient stage fires (*FSH 6709.11, Sec. 6-4c*), safe evacuation of personnel, containment by exterior attack, and protection of exposed improvements. At Forest Service administrative sites located within the jurisdiction of state and local structural fire departments, structure fire suppression responsibility must be coordinated with state and local fire departments.

FSM-5137.4 – Vehicle and Dump Fires. Do not undertake direct attack on vehicle or dump fires on National Forest System lands unless such action is absolutely necessary to protect life or prevent the spread of fire to the wildlands. For additional fire service and homeowner information regarding wildland/urban fire refer to FIREWISE.ORG on the Internet.

Respiratory Protection

Any use of respiratory protection (e.g., dust masks, half-mask respirators, self-contained breathing apparatus-SCBA, etc.) must be in compliance with agency safety and health regulations (BLM 1112-2) and OSHA's Respiratory Protection Standard (29 CFR 1910.134).

BLM – Only employees trained and qualified to use SCBAs and permanently assigned to states with an approved SCBA Program are authorized to

**Only employees trained and
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use SCBAs. When these employees are operating outside their state, the host State Director must authorize the use of SCBAs.

USFS – FSM-5135.3 – Self-Contained Breathing Apparatus. Wildland firefighters may deploy only an open-circuit, self-contained breathing apparatus (SCBA) of the positive pressure type when smoke from vehicle, dump, structure, or other non-wildland fuel fire cannot be avoided while meeting wildland fire suppression objectives (29 CFR 1910.134, *Respiratory Protection*). If such an apparatus is not available, avoid exposure to smoke from these sources. The acquisition, training, proper use, employee health surveillance programs, inspection, storage, and maintenance of an SCBA must comply with the national Fire Protection Association Standard, NFPA-1981 and 29 CFR 1910.134I, and be justified by a Job

Hazard Analysis. Where an SCBA is approved, it may be carried only on a fire engine and its use must be consistent with *FSM 5130.2* and *FSM 5130.3*.

Wildland/Urban Interface Watch Outs

Checklists are provided in Appendices and the *Incident Response Pocket Guide* for safe and efficient responses and operations. The primary considerations are firefighter safety and public safety.

Appendix W: Wildland Urban Interface

Appendix X: Structure Triage

Appendix Y: Structure Go/No-Go Reference

Appendix Z: HazMat IC Checklist

Hazardous Materials

Hazardous Materials Response Requirements For Wildland Firefighter

All emergency service personnel are required to be trained in hazardous materials response. There are

**First responders at the
awareness level are those
persons who, in the course of
their normal duties, could be
the first on the scene of an
emergency involving
hazardous materials.**

several levels of hazardous materials training including "first responder awareness," "first responder operations," and "technical." This section addresses the "first responder awareness" and "first responder operations" level only. First responder awareness and first responder operations levels shall receive training to meet applicable United States Department of Transportation (DOT), United States Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), NFPA 472 Standard on Professional Competence of Responders to Hazardous Materials Incidents, and other appropriate state, local, or provincial occupational health and safety regulatory requirements. This training is offered in many locations and requires approximately 8 hours.

First responders at the awareness level are those persons who, in the course of their normal duties, could be the first on the scene of an emergency involving hazardous materials. First responders at the awareness level are expected to recognize the presence of hazardous materials, protect themselves, call for trained personnel, and secure the area. First responders at the operational level are those persons who respond to releases or potential releases of hazardous materials as part of the initial response to the incident for the purpose of protecting nearby persons, the environment, or property from the effects of the release. First responders at the operational level are expected to respond in a defensive fashion to control the release from a safe distance and keep it from spreading. Training for the operational level requires approximately 24 hours.

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The Black Box Principle and Approach for Missing Firefighters

By Geoff Williams
QFSM, ChFI,
CIETecRI, MIFireE

The current system and procedures for rescuing firefighters who are deemed to be reported missing within a fire or other dangerous non-fire environment vary significantly internationally.

The UK approach is to have a self contained safety team nominated to wait outside and to quickly respond if an emergency occurs. This is commonly referred to as the 'BA Safety Team'. Usually, they will have a resuscitator and other equipment established in a designated holding area where any victim who is rescued by them will immediately be carried to. This is usually near to the entrance to the building or area that is affected by the emergency.

In the USA, more importance is now being

placed on having a similar designated team for rescuing their colleagues and this is generally titled a 'Rapid Intervention Team' or as it is more commonly referred to as the 'RIT Team'. Again, a similar pattern emerges, i.e. an area is usually commandeered and utilized for the team to set up their recovery essentials, e.g. Resuscitation equipment, Trauma pack, RIT Packs, etc.

Up until now the general communication link between outside and inside the incident has simply been radio communication. If any team



experiences some form of trouble (or an individual member within a team faces personal difficulties), the usual practise is for a radio message to be sent to the accountability officer requesting immediate assistance. This is when the 'Safety (RIT) Team are rapidly deployed to seek and find their troubled colleagues.

In reality this is generally acceptable except for the occasion where a team (or individual) becomes unable to call for assistance due to them being incapacitated, e.g. a beam collapse striking them and knocking them unconscious.

Countering the 'incapacity mode'

To counter this 'incapacity' mode, all personal alert systems (PASS)/ distress signal unit (DSU), automatically sound an audible warning device when the BA wearer has not moved for a limited time period. This hopefully raises the alarm that someone is in distress and other BA teams working within the location will attempt to find their stricken colleagues. Equally, once Officers are alerted outside the building/area, etc. The Safety RIT Team will also rapidly set out to find the location of the distressed BA wearers.

The need for new ways of reasoning, imagining, training and planning, to advance the Emergency Services preparedness for today's challenges and those of the future no longer has to solely rely on the chance of someone hearing a firefighters audible personal alarm system being activated. Equally, the need for Breathing Apparatus fire Instructors to improve their techniques and understanding of what actually helps their firefighters when wearing BA is an essential part of this equation. Firstly, the SCOTT BA Vision 3 Facemask is a typical example where an item of equipment has been manufactured to the highest recognised European standard and uniquely designed to allow full Firefighter vision of 320 degrees. Many Instructors are unaware that this

specific face mask can actually help reduce the onset of claustrophobia on their Firefighters by providing a more 'open' vision environment which reduces the feeling of the enclosed, restricted feeling that traditional masks can produce. This restricted feeling can assist in triggering a 'Claustrophobia' attack and causing incalculable detrimental affects to their safety.

Is this the Black Box Principle and Approach we've been striving for?

Technological advancements have now been developed to prepare firefighters with what I term the 'Black box' principle – in essence a new approach to finding fallen firefighters. The analogy is simple: at last we have systems that protect firefighters, systems that when combined can locate missing firefighters, monitor their BA's vital status when things are going to plan and also when they do not. This is indeed very similar technology to that which enables a 'Black box' system to monitor aircraft during take off, in-flight and landing and to find this device when on the rare occasion things go wrong.

Although not all items are located within 'one box', they are available to be positioned on the firefighters body without causing too much weight to be borne, a form of 'tool-set' approach.

To achieve this full 'Black box' analogy, new primary safety aids are now available to 'tool up' the twenty first century firefighters.

Overcoming poor BA Communications

Firstly, when one considers that one of the biggest problems firefighters face is inadequate communications between 'inside and outside' the incident with their speech being distorted by their BA masks. Communication systems such as the SCOTT Sabrecom, Envoy and Easy Com address this issue by providing an interface between the face mask and the radio to provide clear speech

transmission. They incorporate highly flame resistant materials, provide intrinsically safe operation and a hands free 'push to talk'. With these types of products, this initial "communication issue" has therefore been dramatically reduced and one could argue actually 'removed'.

Secondly, new 'Telemetry' systems that are now available from leading respiratory protection suppliers are increasing the monitoring of firefighter performance. One example of this system is the Scott Integrated Radio Information System commonly referred to as the IRIS. This is a fire ground monitoring system that provides digital information alongside a failsafe pneumatic gauge; constantly providing accurate information on cylinder air reserves and time to whistle. This Personal Alert Safety System/Distress Signal Unit PASS/DSU when combined with an optional telemetry module, allows vital information including man down activation to be sent to the control (accountability) officer in real time, outside the danger area so that he/she can monitor these important aspects of safety. Here the time to low air warning whistle and temperature are displayed and all data is automatically being logged in the system for after event analysis.

Developing good communications and telemetry as the norm

With the introduction of these two systems alone, firefighter safety is radically enhanced, and how long should we wait before good communications and telemetry are simply the 'norm' for all firefighters? However when seeking out a fallen firefighter the sense of 'hearing' is still the main key to finding that person.

All experienced firefighters know that during a large fire the noises from live machinery, creaking walls and floors, activated fire alarms, pumping sprinklers, the actual roar from the fire and all the nozzle/jet operations all seriously impede their capability to hear clearly. Combine this with the necessity for protective flash hoods and full head protection helmets the dilemma soon becomes apparent, namely the ability to hear the sound of colleagues alarming PASS/DSU can be severely reduced. This has been one of the biggest challenges for fire equipment suppliers and has always been a major cause for concern until now.

No longer solely relying on sound – locating by High Frequency signal

A revolution in locating firefighters in distress no longer has to solely rely upon sound. SCOTT has designed a firefighter locator titled: The Pak Tracker which will be launched in the autumn of 2006. *N.B. the title 'Pak' refers to their BA sets, namely the Pro-Pak and Air-Pak® Fifty™.*

This unique tool is available as either an integral device fitted directly into the SCOTT SCBA set back plate (*Air-Pak only at present, Pro-Pak to follow*) or as a 'Stand Alone' device which can be used by anyone wearing any form of manufacturers SCBA set, or for people who are not needing to wear BA but need some form of locating device for extra safety while working in potentially dangerous environments. e.g. USAR Teams, Watching Duty teams, *et al.*

It consists of two components; one that is a personal transmitter and the other which is a hand held receiver. The former being similar to the size

of a Pager (weight 0.226kg) and the latter being similar in size to a small Thermal Image camera, (weight approx 0.997kg).

The Pak-Tracker Locator is a distress alarm system designed to locate individuals at a distance of greater than **300** metres line of sight when they are unable to safely leave immediately dangerous to life and death environments. Unlike previous ultrasonic or infrared-based tracking systems locating systems, whose signal can be scattered or blocked, Scott's system works on the principle of **2.4 GHz RF** signal. These are high frequency radio waves that effectively penetrate dense smoke and structural barriers like walls and floors.

Alarm Activation of the transmitter can be achieved in two ways, namely: Self activation by manually pressing the alarm activation buttons – or if a firefighter is incapacitated for any reason – an automatic alarm transmission commences if no movement is recognised within 30 seconds. *N.B.* This time lapse period can be adjusted to whatever the Fire and Rescue Service demands as most suitable for their specific risk situations.

As a rescue team gets closer to the fallen firefighter the hand held receiver increases its audible tone to indicate they are fast approaching the victim.

The hand held receiver incorporates both visual and audible signals to guide a searcher to the downed firefighter. A large LCD visually displays active transmissions (denoted by a specific ID number per transmitter) or the specific transmission signal of the downed firefighter being searched. A bright LED display indicates the signal strength of the transmitter being located, while high intensity graphical bars incrementally illuminate when signal strength is greater than 50. An additional LED indicates a low battery condition. As a rescue team gets closer to the fallen firefighter the hand held receiver increases its audible tone to indicate they are fast approaching the victim.

Conclusion

In conclusion, technology is now where the World's Fire and Rescue Services need it to be, i.e. striving to make the tasks safer for their firefighters working in highly dangerous environments.

First line responders need to be constantly telling fire market equipment producers what tools they need to do their job more effectively, efficiently and more safely. There is *no room for complacency*. They must never let up in this quest to help manufacturers improve their products. Good producers such as SCOTT will be more than keen to listen.

The new threats and battles that our front line emergency services are being expected to fight are increasing all the time therefore we need to provide them with maximum protection. Cutting-edge technology is now available to help in that task and we now need to ensure that we get these new 'weapons' to our front line troops as quickly as possible!

IFF

Geoff Williams, QFSM, ChFI, CIEtecRI, MIFireE

President of the International Emergency Technical Response Institute (iETRI), Fire Sales Manager for SCOTT Health & Safety Ltd, Europe, Middle East, Africa and Australasia.

Technical Board Advisor for Fire Emergency Training Network (FETN), Texas, USA.

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Photos: West Yorkshire Fire service / Eski



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Long-lasting resistance of the clothing to the different types of conditions is required. Pic courtesy West Yorkshire Fire Service



Innovations in the Firefighter World

By Christophe Didelot

Clothing has always been fundamental to increased protection for firefighters against heat and flames, as well as improving comfort levels when working in difficult conditions.

Innovation today means that clothing is made up of new materials, combining heat and fire protection together with comfort, breathability and protection against heat stress.

Stricter regulations regarding fire safety and changes in market requirements have resulted in the development of new high-tech protective fabrics combining several key properties.

Firefighters' turnout gear fulfils several requirements.

- It is the first protection barrier when facing a fire.
- The multi-layer ensemble must have a high and long-lasting resistance to the different types of conditions (abrasion, chemical and heat) it might encounter, in order to maintain protection on the job.
- Comfort is not only a question of well being for the firefighter, it can be a matter of life and death. Protective garments must also allow the wearer to fulfil their role in a fire.
- Firefighters have to perform their job in public, so aesthetics also have to be taken into

account. Durability of the clothing is ensured thanks to the ease of care, colourfastness and no pilling.

Designing clothing that meets these requirements is challenging because the necessary qualities can appear contradictory, such as comfort and protection. It is only by a good understanding of the major parameters and by maintaining a good dialogue with users that products can be improved continuously and the best balance can be achieved. All of the studies conducted by KERMEL and the feedback from users have allowed us to develop new products with our partners in the textile industry that meet the EN 469 standard as well as all the quality criteria that are important to firefighters.

To go beyond the EN 469 standard

The EN 469 standard describes the limits of protection of Personal Protective Equipment, and indicates the minimum performance level to be reached.

That leaves a wide door open for innovative

solutions that will meet and exceed those standards.

But the EN 469 standard does not take into account the suite of clothing, it only defines the performance for structural clothing. It would be more appropriate to certify all of the fabrics worn by a firefighter, i.e. his intervention jacket, overtrousers, as well as station wear and underwear.

Considering this overall concept, future innovation should focus on heat stress, moisture management and lightweight clothing.

In order to achieve these goals, it is necessary to reduce the weight of the external layer of the turnout gear, as well as that of the thermal barrier.

Always at the forefront of innovation, KERMEL has set its sights firmly on the future and with a major research and development drive, which has already led to the filing of a large number of new patents. KERMEL has prerequisite criteria when defining new textile solutions: protection, the integrity of the complex, comfort and appearance, to achieve the best balance.

Wide choices of outer fabrics meet the ever-increasing requirements in terms of protection, durability and comfort. But there are four key areas of development.

1. Full textile concepts adapted to the needs of the wearer

KERMEL has also worked on new technical textile solutions where the certification is made on all of the firefighter's clothing and not only just on the structural firefighting kit.

Thermal protection tests are undertaken on the minimum equipment worn by firefighters, as in Italy; where each firefighter has at least one under garment (poloshirt or shirt), and one item of station wear (summer or winter).

Protection and comfort requirements vary from one situation to the next, so the solution is to develop equipment that is adapted to the environment, the climatic and working conditions in different countries.

That is why Kermel® fibre comes in a complete range of fabrics to meet every demand and every standard.

The same priorities apply to air permeability moisture management

Air permeability moisture management is essential for long term work in hot and moist atmosphere, i.e. working conditions of firefighters when combating fire in closed spaces.

In these situations, garments with a low weight, high breathability together with a high level of thermal protection are essential to do the job properly.

That is why KERMEL has developed thin, light assemblies using a selection of high performance layers that limit the "wearer heat", providing increased comfort.

Due to its intrinsic softness, Kermel® fibre allows the manufacture of different high-quality fire-resistant knits that contribute efficiently to improved protection against thermal hazards while providing wearer comfort and easy maintenance for the user.

Kermel® is certified Oeko-Tex Standard 100, an advantage when a very wide range of knits is worn in direct contact with skin.

2. Lightweight garments

For more than 10 years, KERMEL has been providing firefighters with Kermel HTA® solutions with assembly weights of approx. 550 g/sm meeting standards, when the average of other assembly ranges from 620 to 650 g/sm.

Its lightweight solutions guarantee flame and heat protection, high breathability as well as high levels of comfort.

The fabric acts as a true shield against flames and radiation, is extremely thermostable and very strong.

Kermel HTA® fabrics are well known and recognized by many firemen throughout the world. They remain the most resistant fabric on the market, thanks to the different layers made out of the same fibre with a three-dimensional thickness.

3. Strong outer fabrics

The latest addition to the wide range of outer shells for turnout gear is Kermel H66, developed by the KERMEL Research and Development centre. Reinforced by a special filament yarn, the fabric has incredible mechanical properties, whilst also being resistant to UV ageing and degradation.

Extended testing on Kermel H66 fabric shows less than 15% tensile loss after 100 hours of Xenon exposure where in general, other fabrics with para-aramid blends lose from 40 to 50% of their tenacity.

As is always the case with spun dyed Kermel® fibres, colour fastness is extremely good, typically between 5 and 6.

Kermel H66 fabrics provide a highly technical level of performance, combined with a competitive price, unique appearance and effective durability.

Test results are much higher than the levels defined by the EN 469 standard, especially in terms of tear strength and puncture resistance.

Kermel H66 is the unique product weighing 220 g/sm and reaching such a high level of mechanical performance.

4. Inclusion of a thermal barrier

The outer fabric, the membrane carrier, the thermal barrier and the lining are part of a multi-layer assembly.

KERMEL has already proposed several fabrics including the thermal barrier in the outershell of the fire suit, an innovation within the textile habits where it is of common use to lighten the external layer.

KERMEL is committed to a continuous programme of development on a new range of solutions with the same weight and a better protection, or with the same protection and a lighter complex weight of 10 to 15%.

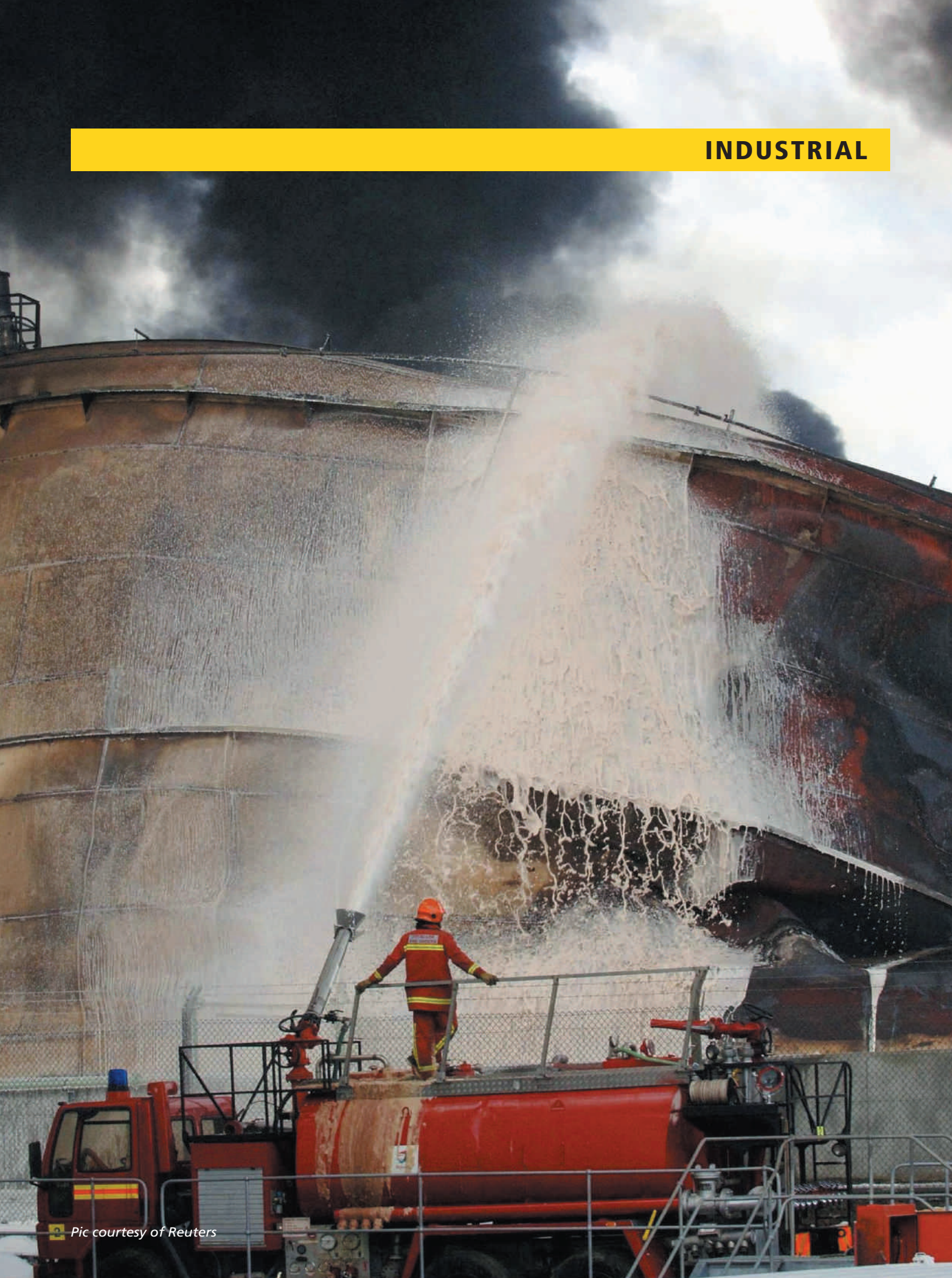
This is an innovative concept, because thermal barriers are generally heavier than the solutions proposed by KERMEL.


In the future, weaving technology will continue to improve with a three-dimensional structure that includes "layer of air" and a blend of fibres bringing advantages in terms of comfort and resistance.

KERMEL has also developed a single layer garment system for use in fighting wildland and forest fires.

As with all our solutions for protective clothing for firefighters, it combines protection with comfort to the wearer.

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 Pic courtesy of Reuters

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Pic courtesy of Crowcon



Confined space rescue . . .

By Paul Gunnels

Lieutenant/Paramedic,
College Station Fire
Department

Imagine . . . for a minute that you hear a tone-out for a confined space rescue with a patient unconscious and unresponsive in a vessel. What is your first thought that comes to mind?

Confined Space environments are situations that can negatively impact lives in just a matter of seconds. Without proper training for those personnel tasked with entering the space, life can be altered forever. Confined Spaces are deceptively dangerous as a result of all of the unknown hazards that may be present. On Average for every person that dies in a confined space accident at least one other would-be rescuer also perishes. When a person becomes a victim in a confined space, the rescuers are normally the co-workers standing outside of the entry area. These co-workers become the rescuers when they see a fellow worker become unconscious and unresponsive. Most of the time they don't have the knowledge and skill level to undertake such an effort but the emotions of the moment take over and wills them to enter the confined space area in attempt to rescue the victim. This action is normally one that turns out to be fatal for the would-be rescuer. Why does this happen? It is often because of false beliefs that they can hold their breath long enough to get the victim out of the confined space when, in fact, it will take much longer.

OSHA (Occupational Safety and Health Standards), NIOSH (The National Institute for Occupational Safety and Health) and NFPA (National Fire Protection Association) are a few sources that provide great information about confined spaces. OSHA 1926.21 (b)(6)(i) "states that all employees that are required to enter into a confined or enclosed space shall be instructed as to the nature of the hazards involved, the necessary precautions to be taken, and in the use of protective and emergency equipment required. The employer shall comply with any specific regulations that

apply to work in dangerous or potentially dangerous areas". Also Confined Space is defined under OSHA 29 CFR 1910.146 (b) in three main areas. . .

- 1** Is large enough and so configured that an employee can bodily enter and perform assigned work; and
- 2** Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.); and
- 3** Is not designed for continuous employee occupancy.

NIOSH provides useful information on Case Reports of Fatal Incidents involving confined space accidents including rescue workers that were killed while attempting to rescue victims. NFPA provides lots of great information that can help define the level of training emergency personnel should have before conducting confined space rescues.

- NFPA 1006 Chapter 9 – Confined Space Rescue
Annex G – Rescue Technician Took Kit
- NFPA 1670 Chapter 7 – Confined Space Search and Rescue
Chapter 6 – Rope Rescue
Chapter 11 – Trench and Excavation Search and Rescue
Annex I – Confined Space Needs Analysis Plan
- NFPA 472 Chapter 4 – Competencies for the First Responder Awareness Level

These are just a few sources that can provide great insight to information and safety for confined space search and rescue. Having to do the research from all of these organizations and build a confined space rescue response team can be very overwhelming.

Outline

- 1** Define Confined Space
 - a. OSHA
 - i. **OSHA 29 CFR 1910.146** (Confined Space Defined)
 - ii. **OSHA 1926.21 (b)(6)(i)** (Employer Responsibility)
 - b. NFPA
 - i. NFPA 1670 Standard on Operations and Training for Technical Search and Rescue Incidents
 1. **Chapter 7** – Confined Space Search and Rescue
 2. **Chapter 6** – Rope Rescue
 3. **Chapter 11** – Trench and Excavation Search and Rescue
 4. **Annex I** – Confined Space Needs Analysis Plan
 - ii. NFPA 1006 Standard for Rescue Technician Professional Qualifications
 1. **Chapter 9** – Confined Space Rescue
 2. **Annex G** – Rescue Technician Tool Kit
 - iii. NFPA 472
 1. **Chapter 4** – Competencies for the First Responder Awareness Level
 - iv.
 - c. NIOSH
 - i. Case Studies of Fatalities including rescue workers
- 2** Training
 - a. Levels
 - i. Awareness
 - ii. Operations
 - iii. Technician
 - iv. Command (Incident Management System – ICS)
 - b. Atmosphere Hazards
 - i. Oxygen
 - ii. LEL/LFL
 - iii. Toxic Levels
 - c. Physical Hazards
 - i. Entanglement
 - ii. Access Size
 - d. PPE
 - e. Entry
 - i. Vertical
 - ii. Elevated
 - iii. Horizontal
- 3** Equipment
 - a. Research
 - i. Cost
 - ii. Durability
 - iii. Maintenance/Service
 - iv. Available with in the organization
- 4** Policies
 - a. Entry Policy
 - b. Accountability
 - c. Command (IMS)

When building a team to respond to these types of emergencies, it simplifies things to divide it into three areas that will help in the management of this program:

- 1** Training
- 2** Equipment
- 3** Policies

These are the three main areas of focus. Dividing them up into these areas allows you to take a look at each area of development and monitor its progress. This can be a very costly undertaking that could possibly take a year to become proficient in confined space rescues. One thing that may provide you with greater success is to have a few people from different disciplines involved with the development of this team. A hazmat technician and rope rescue technician can provide some of the needed knowledge and skills to help in the

training of the basics for the team. In today's world, you see more people becoming cross-trained in different disciplines because of staffing levels. Generally speaking, usually only large metropolitan departments have enough personnel and demand to warrant dedicating specific members to each discipline. Disciplines include areas such as rescue and hazmat. These areas should be balanced in order to keep your people proficient in each discipline. Because the same knowledge and skills are used in different disciplines, it is easier to do. However, we must always be alert to the fact that not everyone can do everything proficiently.

Training

Training is the most important area to start with before you purchase equipment and develop policies. Training is the part that will provide the understanding of what equipment you will need and what policies need to be developed and implemented before the confined space rescue team becomes operational. Confined Space has three levels of training:

- 1** Awareness
- 2** Operations
- 3** Technician.

When training in these three levels you will see knowledge and skills overlaps between disciplines.

Awareness level for confined spaced emergencies are covered in NFPA 1670, Chapter 7 – Section 7.2 which is very basic training covering topics like how to recognize a confined space, how to activate a confined space rescue team, how to do a non-entry retrieval and site control and management. At this level under NFPA 1670, it refers to covering the information under NFPA 471, Chapter 4 also covering awareness level training on many topics to include how to recognize what a hazardous material is and how to identify it using MSDS (material safety data sheets), ERG (emergency response guidebook), NFPA 704 – Standard System for the identification of the hazards of materials for emergency response, and shipping papers for transport (air, highway, rail and water).

Operations level covers every thing in the awareness level, plus NFPA 1670, Chapter 7 – Section 7.3. It also includes Chapter 6 – Section 6.3 operations level for rope rescue and Chapter 11 – Section 11.2 awareness level for trench and excavation search and rescue. The operations level training is where a team of at least four individuals with this level training can attempt a confined space rescue once they are all on scene. When a confined space rescuer with operations level training makes entry, there are a few critical resources/components that must be in place. Only two of the four can make entry at a time. The first two can act as primary rescuers but the other two must remain outside of the confined space as back up rescuers. They are backup for the primary rescuers just in case something should happen and they need to be rescued themselves. Think of this as the two in, two out rule. The primary rescuers can only make entry if the victim is visible from the primary access point without the possibility of entanglements. The entry area must be large enough so that entry can be made with ease while wearing the proper protection equipment. While doing this type of rescue, they will have to monitor the atmosphere for oxygen content, flammability (LEL/LFL), and toxicity in that order. There is an important reason why you should read the monitor

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reading in this order. It is because if the oxygen level drops below 21% the LEL reading will be incorrect and misleading. This will also depend on the type of monitor used. Therefore you should read the information from the manufacture to see the parameters. At this level, you might use rope lowering and raising (haul) systems in the high angle environment, removing victims with patient packaging devices to get them from the confined space.

Technician level covers all areas in awareness and operations level plus NFPA 1670, Chapter 8 – Section 8.4 technician level for vehicle and machinery search and rescue. This level represents the highest level of training, experience and competency. The technician level is the level where at least six individuals trained must be on the scene of a complex confined space rescue in order to execute the rescue. Technicians are able to enter horizontally, vertically or elevated containers. There are really no parameters for technician level rescues other than to keep safety first at all times.

During any type of rescue a command system needs to be in place. The Incident Management System (IMS) is a system that is planned to be a systematic development of a complete and command system. IMS is designed to be functional on incidents involving as little as a single unit response to those that involve multi-agency. Use of the IMS increases the safety of all rescue workers on scene through accountability and provides a way to call for more resources as needed. This system was comprised from California FIREScope Incident Command System (ICS) and Fireground Command (FGC). The Incident Management System (IMS) is designed to allow for the flexibility to expand the organizational chart to provide command and general staff positions to assist Incident Commander (IC) when needed. Safety Officer, Information Officer (PIO), and Liaison Officer are command staff positions and Operations Section, Planning Section, Logistics Section, and Finance/Administration Section are general staff positions in the Incident Management System (IMS). With the incident management systems in place, it helps in the accountability system to track all personnel on scene and confirm everyone is safe and accounted for.

Training is one of the critical areas that must be well planned and done on a regular basis in order for confined space rescuers to become proficient. Confined space rescues are very complex and utilize so many other disciplines such as rope rescue, hazmat, vehicle and machinery search and rescue which is why it is one of the hardest to keep proficient in. Due to the complexity of this type of training, it is best to have some of the team members travel to other training programs to see new technology and learn from others outside of the regular circle. This helps to keep people interested and provides a moral boost for the whole team to be allowed to do this type of training from time to time. One thing I have learned with all of my training is that you can learn from anyone if you are willing and will most likely enjoy it at the same time. There is no reason to reinvent the wheel when you can get the information needed from someone else thru networking. We are all in the rescue business to make a difference and the time we take to learn from and teach others is valuable and provides us all with knowledge we can not get from just our small circles. We must venture out to learn outside of our comfort zones.

Paul Gunnels is Lieutenant/Paramedic at the College Station Fire Department with 20 years in the Fire Service. He is Adjunct Rescue Instructor for TEEEX and Texas Task Force 1 (USAR) Squad Officer.

Equipment

What type of equipment is needed for a confined space rescue? Well, a good place to start is with NFPA 1006, Annex G – rescue technician tool kit that provides a great start to what would be needed for confined space rescue incidents. When looking at equipment, you will find it to be expensive and you should look for equipment that has proven to be effective by others.

There is a chance you might already own some of the equipment needed for confined space rescues because other disciplines utilize a lot of the same equipment. If you find this to be true, with just a little reorganization of equipment it could be usable for multi-disciplines. By doing this you can reduce the overall cost of equipment in the initial purchases. I personally have bought things that seem to be a great idea at the time but with in short time have realized that the money could have gone to a better cause. This is something we have all probably dealt with during purchasing new equipment. I would recommend taking a look at what other confined space rescue teams are using. I have visited some of the smallest fire departments and found things they are doing that are great ideas and bring them back to my department. Other places to visit are training facilities that teach confined space rescues to see how they package their equipment. They deploy it so many times in training they have mastered what to carry and how to carry it and they also have devised ways to protect the equipment during such heavy uses. Life Safety Rope is an example of equipment that the better it is cared for, the longer it will last. Equipment is a major investment and it should be taken care of in order to provide a longer life. After all, lives depend on it being in service.

Policies

Policies and Standard Operating Procedures are very important for many rescues because it provides a way to make sure everyone is on the same page and has the same information. The areas that should be focused on are: initial entry into a confined space for rescue, check list that is completed before entry is granted for the rescue, accountability of personnel on scene and Incident Management System (IMS). These are just a few that would provide some added safety on scene of this type of emergency.

Conclusion

What was your response to hearing the tone-out for a confined space rescue? No matter what your initial thought was, I bet it included safety concerns for the rescue team members responding to the scene. The most powerful knowledge we must ascertain is when it is unsafe to enter and then we must have the discipline not to commit team members during these situations because our first duty is in the protection of our team members.

There are many areas that were just not covered within this article that you will need to research and train on. As an employer you may have a responsibility to respond to confined space emergencies within your jurisdiction and with this comes a major responsibility to have your team properly equipped and trained. I would recommend sending team members out to other organizations for training or just to visit with them about their own confined space rescue program. The more information we gather the more successful we will be in providing the best service to our citizens within our jurisdictions. **IFF**



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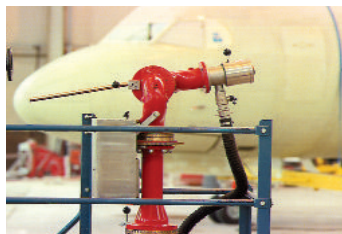
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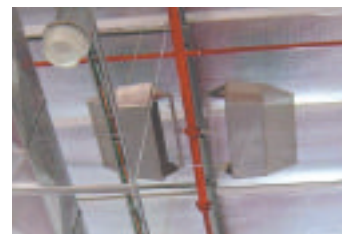
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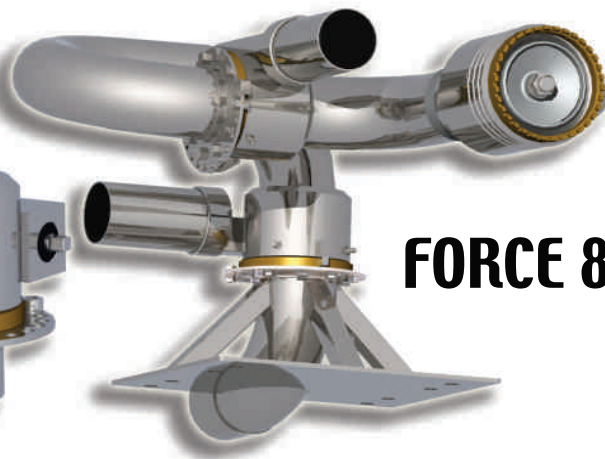
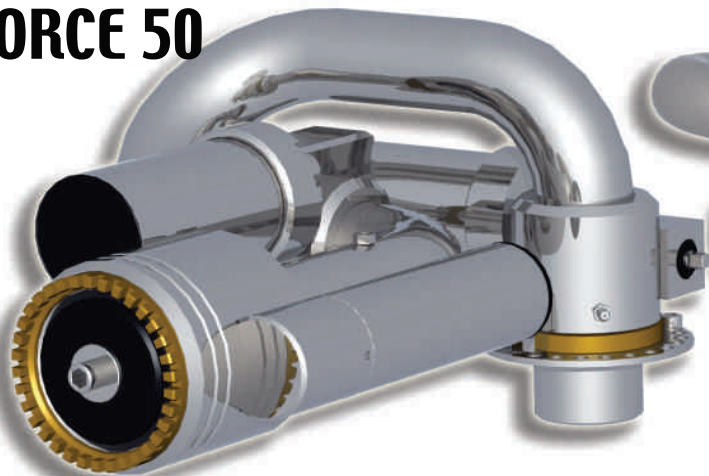
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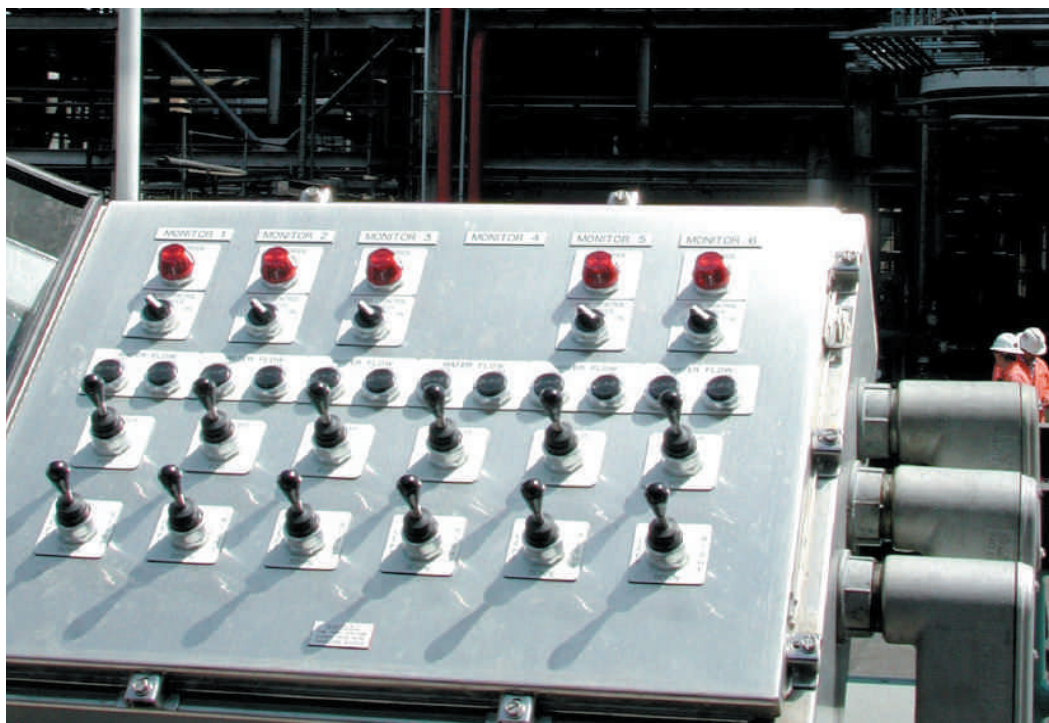


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Pic courtesy of Elkhart Brass



Electronic Remote Controlled Monitors:

Endless Design Flexibility and Cost Effective Options Make Them Today's Standard for Advanced Fire Protection

Industrial fire protection is an ever evolving field that has progressed over the years to keep up with our ever changing global market. The fixed fire water monitor has been the foundation for facilities worldwide to provide immediate control of unexpected incidents.

By Chris Martin

Regional Export Sales
Manager, Elkhart Brass
Mfg. Co, Inc.

Advances in technology and needs of progressive facilities have helped to drive the design of monitors to where they are today. In this process the standard fixed system monitor has progressed into a high tech electronically control monitor with a seemingly endless list of options and features. The actions taken after a catastrophic industrial event may make the difference between containment and escalation. Risking firefighter safety to control fixed manual monitor, versus being able to remotely control your monitor system from a distance is a concern that should not be taken lightly. Will the firefighter have to be in a potentially highly explosive environment to be

able to control the monitor? Will he or she be able to effectively hit the target from his or her vantage point? Worldwide, the trend is now shifting to favor electronic remote controlled monitors due to their enhanced flexibility and reliability in all facets; safety, design, installation, and operation.

A natural progression has taken place in the industry to get to the advances that we have today with electric remote controlled monitor (ERCM) systems. The traditional fire monitor was a proven piece of equipment with a strong work history. Its durable all brass construction held up in the toughest environments, however still required manpower at the monitor to operate it effectively.

Pic courtesy of Elkhart Brass



As technology progressed elevated versions were fabricated to help direct fire streams at what were once unreachable targets. Crude, but effective, cable and chain driven controls were used to operate these monitors remotely. As advances in hydraulics occurred, these were applied to the control of monitors. Still the system of choice for certain high hazard environments today, hydraulics were able to add vast flexibility to a monitor system allowing for several control stations and monitor configurations. The common component in all of these systems, however, was still the same style traditional fire monitor. These older, traditional style monitors lacked the high flow efficiency of the monitors that we are used to today. The split waterway design added turbulence that limited reach and flow rates to a maximum of 1100 gpm (4164 lpm).

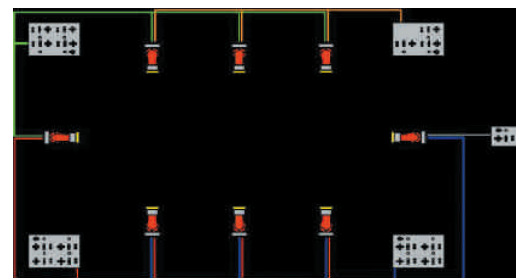
Advances in monitor design have taken all of these deficiencies into account and the result is the modern ERCM system. ERCMs compensate where past systems have lacked. The base for this system is an updated monitor design made of high quality marine-grade brass with improved flow rates and efficiency for the harshest of environments. Flow rates of up to 2000 gpm (7571 lpm) can now be achieved with improved reach due to a larger waterway with a built-in cast shaper vein to reduce turbulence. Synchronous AC Electric motors are fully enclosed and sealed in watertight housings. Building on this monitor the facility can now tailor an ECRM system based upon individual needs. Advances in electronics have vastly improved the flexibility and capability of each system. With an ERCM system, variance in configurations of monitors is immense due to these advances. Monitors are controlled electronically and no longer require the use of tedious hydraulic systems that need a much higher level of maintenance and have a much shorter lifespan. In an electronic system, wires now replace hydraulic hoses filled with fluid. This simpler design requires fewer parts and drastically decreases maintenance and installation costs. Monitors can be linked together over much further distances using low cost communication cable, fiber optics, and local

and master control panels can be installed and linked with greater ease. Not only does this cut cost on installation and maintenance, but it facilitates system expansion as future growth arises.


As ERCMs grow to become the preferred fire protection monitor it is important to take a system approach to specification. Flexibility of the design is essential due to the individualized needs of each facility. It is necessary to find a manufacturer that has the capability to meet your every need and will work with your facility to satisfy those needs. Throughout the process, system accountability is imperative. Adequate accountability will insure that your project goes in on schedule, within budget and performs as expected.

When getting ready to plan your ERCM systems there are several considerations you must be ready to address. First and foremost, the timeline and budget are going to be two factors that can restrict the complexity of the system. Details to consider will be is the system going to be located in a hazardous (classified) or non-hazardous (unclassified) area, and are there any special functional requirements that are needed? Examples of these functional requirements could be a water valve, pre-programmable oscillation, or pre-programmable event response so that at the push of a button the ERCM system automatically goes into response mode. Controls are also important to keep in mind. Should I consider a wireless radio frequency control system? How many control stations will I need? How many monitors will each control station actually control? What is the hazard classification of each of these monitors and control panel locations? These can all affect how my system can be configured. These are all questions that need to be considered in the planning stages. The flexibility of these ERCM systems is so vast that you, the user, can dictate what you want and not be limited by the system's parameters. An example of this flexibility is shown below in the layout diagram demonstrating a system that required a redundancy in the monitor controls. In this case a local control panel was linked with other control panels using t-bar electrical connectors. Thus, each control station is able to operate several monitors or groups of monitors, creating a built in back up in case one the controls stations is unmanned or inaccessible after an incident has occurred.


As technology continues to improve and our global market needs continue to change, so will our fire protection needs. Currently advanced electronic remote control monitor systems offer a very effective solution to your fire protection requirements. ERCMs offer increased safety, flexibility in design, ease of operation, lower maintenance and most importantly, at a reasonable cost. **IFF**



Pic courtesy of Elkhart Brass



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Pic courtesy of Angus Fire



Multipurpose Foams For Hazmat Response



By Mike Willson

Product Manager,
Angus Fire

Fires and spills involving hazardous materials are happening more frequently than ever before, posing an ever greater threat to employees, communities, emergency response personnel and the environment. For example, thousands of road tankers transport flammable liquids every day. But if a tanker rolls over, leaks, or spills its contents, then it's up to the local emergency responders to control the incident. The potential for a violent explosion and a major fire can be just one spark away.

Polar solvents

Emergency responders have to contend with numerous flammable liquid hazards these days. Liquid fuels are generally divided into two very different groups, namely those that are not water miscible (mainly hydrocarbons such as crude oil, gasoline, paraffins and aromatics) and those that mix with water (polar solvents such as alcohols, ethers, ketones and esters). The distinction is vital because a fire fighting foam blanket is over 90 percent water.

Hydrocarbon fuels have little or no interaction with the water content of foam and so exert little foam destroying action. The foam is therefore free to get on with its job of blanketing the burning fuel. In contrast, polar solvents are miscible with water. They are often highly destructive to conventional foam blankets. Some polar solvents are more aggressive towards foam than others and so different foam application rates are required (see table). Special foam concentrates are therefore needed with built-in resistance to this attack.

Foam Destroying Action

None

Heptane, Gasoline, Kerosene, Avgas, Benzene, Toluene, Xylene, Naphtha, Cyclohexane, Diesel, Gas Oil.

Slight

Amyl Acetate, Butyl Acetate, Ethyl Acetate, Methyl Isobutyl Ketone, Di-isobutyl Ketone, Methyl Tertiary Butyl Ether, Cyclohexanone, Cyclohexanol, Pentanol, Ethane Diol, Ethylene Diamine, Monoethylene Glycol, Vegetable Turpentine.

Moderate

Acrylonitrile, Acetone, N-Butanol, Iso-Butanol, Tertiary Butyl Alcohol, Methanol, Ethanol, Iso-Propanol, Industrial Methylated Spirits, Dimethyl Formamide, Ethyl Lactate, Ethylene Glycol Monobutyl Ether, Diethylamine, Cyclohexylamine, Diethyl Ether, Trimethylchlorosilane,

Severe

Ethylamine, Isopropylamine, Acetic Acid, Propylene Oxide

Early AR foams


For many years Alcohol Resistant (AR) or Multi-purpose (MP) foam has been the agent of choice for dealing with fires and spills involving polar solvents. With so many hazardous materials around, what emergency responders need more than anything else is a versatile foam that can be used on a wide variety of flammable liquids including polar solvents like alcohols in addition to hydrocarbons. Such versatility is crucial because fire crews do not always know which flammable liquids are burning during an emergency. It can often involve a cocktail of different hazardous materials.

The first such foams were AR versions of FluoroProtein foams (AR-FP). Special additives



resulted in "setting" the foam into an exceptionally stable semi-solid foam. However, such foams are no longer permissible under current environmental regulations. Their rigidity was also a drawback in fire fighting. Today they have been largely superseded by more advanced polymer-based technology.



Polymer-based foams

The next technological breakthrough was the introduction of polymer-based foams. These contained a water soluble polymer of the polysaccharide type that came out of solution when brought into contact with polar solvent flammable liquids. This led to the formation of a skin-like barrier on the



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surface of the polar solvent that physically separated it from the destructive polar solvent.

Today, polymer-based Alcohol Resistant (AR) versions of Aqueous Film-Forming Foams (AR-AFFF) and the more advanced Film-Forming FluoroProtein (AR-FFFP) foams are used world wide. AR-FFFP is like having three foams in one. As well as being an Alcohol Resistant (AR) foam, it is also a Film-Forming (FF) foam and a FluoroProtein (FP) foam. That is why it is classified as an Alcohol Resistant Film-Forming FluoroProtein (AR-FFFP). Its Film-Forming capability means that it forms a thin aqueous film on hydrocarbons that races ahead of the foam blanket to give rapid extinguishment. It is also specially formulated to protect fire crews by preventing sudden re-ignition and burnback. Its bubbles contain a FluoroProtein skeleton that makes the foam highly resistant to heat, and it is detergent-free and so does not become contaminated by burning hydrocarbons or suffer sudden flashbacks.

The earliest polymer-based foams were described as "3-6" foams. In other words, they needed to be induced at 3% on hydrocarbons and 6% on the more aggressive polar solvents.

New polymer-free technology

A problem sometimes encountered with polymer-based AR foams, particularly those products at the lower quality end of the market, is high viscosity. This means that some of them can be thick and sticky, which in turn can lead to blockages and proportioning problems.

Foam concentrates that are suitable for use on hydrocarbons only such as FFFP and AFFF are classified as "Newtonian". In other words, they display constant viscosity at different shear rates. However, polymer-based AR foam concentrates are classified as "Non-Newtonian" since they display different viscosities at different shear rates. Most Non-Newtonian foams display decreasing viscosity with increasing shear rate, which is known as "Pseudoplastic" or "Shear-Thinning".

Such viscosity complications are not exhibited by the latest AR foams such as Niagara from Angus Fire. This is because polymer is not used to achieve alcohol resistance. Its advanced "polymer-free" formulation works on polar solvents by an alternative mechanism of effectively giving each bubble its own chemical suit! The resulting "high fluidity" foam means that it is easy to pour from

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drums; it flows freely through pumps, pipe work and vehicle proportioners; and it provides accurate proportioning in all weather conditions.

Trouble-free storage

Another advantage of polymer-free foam is superior storage stability. Some of the more viscous polymer-based AR-AFFF foams have often demonstrated storage problems in the past. If such foams are not manufactured properly, then there is a risk that the polymer will come out of solution to form a gel when subjected to extremes of temperature during long-term storage. Most polymer-based AR-FFFP foams have lower levels of polymer and so are much more stable in storage. The latest AR foams do not suffer this problem at all though because they do not contain any polymer. They can be relied on to have a shelf-life of at least ten years, and Angus Niagara is unique in passing the rigorous UL induction accuracy test at minus 18°C when many AR-AFFF foams are frozen solid!

Versatile in application

AR foam must also be suitable for use through a wide variety of foam-making equipment including non-aspirating hand-held water nozzles, low expansion foam branchpipes and monitors, and medium expansion bund pourers. Modern products are also available in 3-3 and 1-3 grades which are proving very popular with fire services because they are so economical.

Low environmental impact

Polymer-free AR-FFFP uses the very latest environmental technology. Its main ingredient is natural protein that is not ecotoxic and readily biodegradable. It contains none of the chemicals that have

led to environmental problems with other types of foam such as PFOS, detergent and glycol ethers. As with any type of modern high performance foam it contains fluorine compounds. Concerns about the effects of these key ingredients on the environment have led some foam manufacturers to develop Fluorine Free Foam (F3) training

Polymer-free AR-FFFP uses the very latest environmental technology. Its main ingredient is natural protein that is not ecotoxic and readily biodegradable.

versions that mimic the physical characteristics of the operational AR foams. While F3 foams should not be used operationally at emergencies, they are ideal for vehicle testing and foam training exercises.

Technical support

Whichever type of AR foam you use, it is important that they are manufactured to the highest standards in full compliance with BS EN ISO 9001:2000 and that it should be independently approved by Underwriters Laboratories Inc. Regular testing is advisable to ensure that it is still fit for purpose. This is particularly important for polymer-based AR-AFFF type foams. Experience has shown that it is also important to deal with a foam supplier that has a proven track-record of delivering urgently needed stocks of foam to major incident sites world wide.

IFF

Mike Willson is Product Manager at Angus Fire responsible for the global marketing of the company's wide range of foam concentrates including Niagara, Tankmaster and Petroseal. Angus Fire is part of UTC Fire & Security, which provides fire safety and security solutions to more than one million customers around the world and is headquartered in Connecticut, USA.



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*Pic courtesy of
Dave Cochran*



Fire hazards at offshore installations

By J. C. Jones

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It is usually considered that the first offshore oil production was off the Louisiana coast in 1945. Whilst this date does indeed mark the beginning of the modern offshore industry, there had been limited offshore activity several decades before that.

The Summerland Oil Field in Santa Barbara County, California, first yielded oil in 1895. About forty wells had been drilled on the beach, and it was observed that the wells closest to the sea were the most productive. Piers extending a short distance over the sea were constructed and sub-sea wells drilled from them. The area containing those wells was formally named Summerland Oil Field (Offshore Area). By the turn of the century there were hundreds of wells in the 'Offshore Area' although management and co-ordination were poor and by 1920 only a few were still producing. The term 'offshore oil field' therefore entered the vocabulary of the industry in 1890s California. Also, it is known that there were wells in shallow water off Borneo in

the 1930s, where previously worked onshore fields had been extended offshore as at the Summerland field.

By these opening years of the 21st Century, when world requirements of crude oil are about 80 million barrels per day, there is offshore oil and gas production off many countries including the US, the UK, Australia, Malaysia, Trinidad and Tobago, Canada and Indonesia. Often oil and gas occur together, in which case the gas is known as associated gas. Gas occurring alone is called non-associated gas. If non-associated gas is rich in condensate – heavier hydrocarbons separable from the gas which can then enter the liquid production stream – a non-associated gas field might be referred to as a condensate field.

Fire hazards

The entire *raison d'être* of an offshore production platform is that it enables hydrocarbons – crude oil, gas and condensate – to be transferred from a well under the sea to a terminal onshore. At any one time therefore a platform will have an enormous inventory of hydrocarbon. Fire hazards are extreme for the following reasons:

- (i) Hydrocarbons are readily ignitable and, once ignited, release heat very powerfully. The calorific value of crude oil is about 44 MJ kg⁻¹, that of natural gas about 25% higher.
- (ii) The available space at an offshore platform has to be used as advantageously as possible, so large amounts of flammable material are concentrated over small areas.

- (iii) Persons on a platform cannot in the event of fire simply leave it unaided but have to await evacuation by lifeboat, ship or helicopter.

The evacuation procedures themselves can be affected by a fire, especially if the fire is very productive of smoke.

The business of offshore oil and gas production is therefore a continual exercise in fire and explosion hazard control and a whole branch of safety engineering has evolved in response to the needs of the offshore industry.

Combustion phenomenology expected at offshore platforms

The table below summarises these.

In the penultimate row of the table the

Type of inventory	Circumstances of leak	Combustion behaviour if there is ignition and possible consequences
Natural gas.	Rapid release through an accidentally created orifice in a pipe or vessel.	Jet fire. Immediately fatal if a human being is within its flame length. Possible non-fatal injuries to persons further away. Possible structural damage to the platform.
Natural gas or two-phase inventory (i.e., crude oil and natural gas not having been separated).	Catastrophic release from a failed vessel.	Fireball. Injuries – fatal and non-fatal – possible by radiation heat transfer from the fireball, which approximates to a black body. An overpressure if the fireball is at all confined, possibly causing injuries to persons and damage to the platform.
Natural gas.	Leakage of the order of tonnes, drift away from the platform and subsequent ignition.	A flash fire or a vapour cloud explosion. Overpressure in the latter but not the former. Possible hazard to helicopters <u>before</u> ignition by effects of the gas on the density of the atmosphere and related buoyancy effects*.
Natural gas.	A confined mixture of natural gas and air in the composition range 5 to 15% and an ignition source.	An <u>deflagrative</u> explosion involving an overpressure. An overpressure of 0.1 bar is sufficient to cause structural damage to an installation or major injuries to persons. <u>Detonation</u> not expected. Such an incident at the Rough field in the North Sea, discussed under 'Case studies'.
Crude oil.	Spillage on to a horizontal surface.	A pool fire. Less powerful than a jet fire, yet capable of causing fatal injuries to persons. If two-phase inventory leaks from an orifice the crude oil can separate ('rain out') and burn as a pool fire whilst the natural gas burns as a jet fire as described in the first row.

*This piece is being written shortly after the helicopter accident in Morecambe Bay close to the gas fields there. There is however no evidence at all that natural gas leakage was the cause of that.

distinction between a detonation and a deflagration is reiterated, the latter displaying supersonic propagation and the former subsonic. It is difficult to see why a detonation should ever occur as a consequence of leakage of hydrocarbon at an offshore platform.

Designed-in mitigation measures

Not only are these numerous but the whole basis of design of offshore installations is dominated by them because of the extreme and unique hazards at an offshore platform noted at the beginning of this article. Fire and explosion prevention begins at the most fundamental design stage, for example in selection of pipes of suitable 'schedule' for the pressures of natural gas they will experience. Pipe work will have emergency shutdown valves at intervals so that in the event of failure of a pipe the inventory able to escape is limited. The pipe itself and the measures taken to limit release in the event of failure are both subject to reliabilities expressed in terms of frequencies and probabilities. There are software packages for aggregating such details for all components of a platform and incorporating, in quantitative terms, the effectiveness of emergency response procedures and evacuation of persons. The path taken by such a computer program will frequently

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bifurcate, for example, to continue according to whether smoke does or does not impact upon the refuge at which persons assemble to await evacuation. To enter all of the structural and configurational details of a particular platform into such a computer package is an enormous task. When executed for a particular platform the programme will predict the probabilities of certain scenarios, the worst of which is loss of the platform and the lives of all those on it. This will be assessed according to ALARP (as low as reasonably practicable) principles when a judgement is being made as to whether a platform is safe to operate or not.

Fire fighting offshore

An extinguishing agent which is available in literally unlimited amounts when there is a fire at an offshore platform is sea water. It is common for pumps powered by diesel to be used when sea water is required for fire fighting at a platform. Such measures will be taken when there has been some escalation of an initial fire. Clearly, if the initial fire itself can be extinguished there will be prevention of escalation and less crude

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methods of extinguishment than deluging with sea water will be applied. The use of Halon in fire extinguishment at oil platforms was once common but these substances are needing to be replaced because of their effect on the ozone layer. Consequently the development of 'Halon substitutes' is a major area of activity. A reader should bear in mind that even once such a substitute has become available its adoption on platforms cannot take place simply on the volition of the platform operator; quantitative calculations establishing the acceptability of the substitute have to be made with the regulatory authorities being kept in the loop.

Case studies

Extreme stringency in the formulation and enforcement of safety measures for offshore installations has led to there having been remarkably few fatal accidents. The worst offshore

accident of all time was of course at the Piper Alpha platform in the North Sea in 1988, when 167 persons lost their lives. The platform was operated by Occidental whose president Armand Hammer, by then aged 90, was one of a team of Occidental management who fielded questions from the media after the accident. Occidental

Extreme stringency in the formulation and enforcement of safety measures for offshore installations has led to there having been remarkably few fatal accidents.

withdrew from North Sea activity after the accident. There were no deaths or injuries when a gas explosion occurred at an offshore storage facility in the southern North Sea in February 2006. This was at the Rough field off the Yorkshire coast, and the facility was operated by Centrica. The present author gave an interview on BBC Radio apropos of the incident.

In the Gulf Coast, one of the world's major scenes of offshore activity, there is the additional hazard of hurricanes. The first recorded hurricane in the Gulf was in 1527, at which time Spanish conquistadors were exploring there. The first hurricane in the Gulf after offshore oil production began was in early September 1948 when a hurricane hit Timbalier Bay, Louisiana. Where hurricane damage results in loss of hydrocarbon inventory there can of course be knock-on effects due to fire. Such an incident occurred at New Orleans LA in 2005, as a result of Hurricane Katrina. There was explosion at a hydrocarbon plant close to the Mississippi River pollution of which resulted. Other hydrocarbon facilities in New Orleans, including two oil tanks each holding

In the Gulf Coast, one of the world's major scenes of offshore activity, there is the additional hazard of hurricanes.

a million barrels, were affected by the Hurricane. 'Rainbows in the water' on the Mississippi River were one of the visible signs of the catastrophe and an atmosphere of acrid smoke pervaded the city.

Concluding remarks

Some carefully chosen and hopefully helpful, though inevitably arbitrary, points about fire hazards at offshore oil and gas platforms have been made in this article. Further information abounds on the Web and elsewhere, and it is intended that this article will have provided a previously uninitiated reader with the wherewithal to access such information with reasonable confidence.

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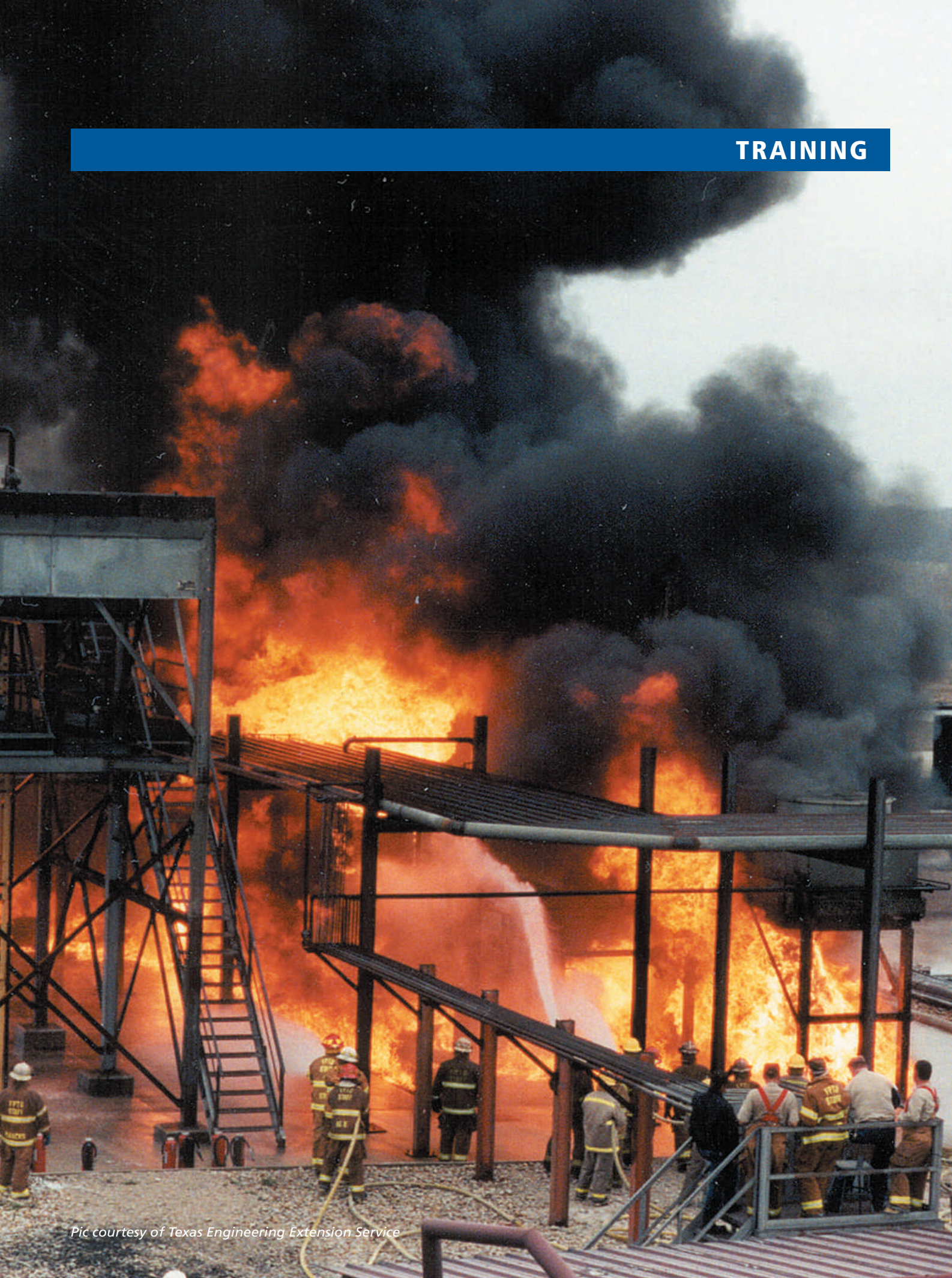
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Disaster City Profile

Masters of Disaster

Convincing replicas of catastrophes set the stage at Disaster City, a 52-acre training ground for urban search and rescue professionals created by The Texas A&M University System's Texas Engineering Extension Service, also known as TEEK.

By Kelli Levey

Rubble piles carefully constructed to simulate disaster sites conceal human "patients," surrounded by collapsible structures mimicking an entire community's infrastructure. Emergency response teams from around the world literally dig into the grounds for training and technical assistance exercises simulating terrorist acts or natural disasters ranging from earthquakes to tornadoes. The hands-on training can be customized to emulate everything — including structural collapses, canine searches, disaster medical services and more.

But what sets this program apart is the extensiveness of its training programs and the comprehensive experience of its trainers. Disaster City remains relevant in the ever-evolving post-9/11 world because its trainers are continuously living their lives and learning new lessons out in the field. When they lead an exercise, they are drawing from those experiences.

Using emergency responders as trainers makes the information indispensable, said Bob McKee, TEEK director of emergency response and rescue and elite urban search and rescue team Texas Task

Force 1, which considers Disaster City its home base for training. "Because we are in the field, we are constantly seeking more effective, efficient and safe ways to do things," he said. "We use the term 'best practices,' and we're always looking for better ways to do things in the field so that lives will be spared and properties will be saved. Our goal is doing what we can so that the least number will be in peril, and that is universal in what we all do."

Billy Parker, who works with McKee as TEEK's Urban Search and Rescue program director and was founding member of the Texas Task Force 1 team, calls it a "been there, done that" approach to training, because TEEK contracts with instructors from all around the country to be sure every aspect is covered. "We bring in the best of the best, people who have had experience and continue to have experience at some of the biggest natural and manmade disasters from the World Trade Center to space shuttle Columbia to Hurricanes Katrina and Rita to the Bonfire collapse [at Texas A&M University in 1999]," Parker said. "When it comes to effective teaching for emergency responders, you



can't beat those types of experiences."

The approach enables the trainers to provide the most up-to-date information about techniques and tricks of the trade. The training is almost purely hands-on, with very few classroom hours. "There's not a lot of lecture time because it's like riding a bicycle: You can't do it reading a book, you have to actually get out there and experience it," Parker said.

After responders complete their exercises and scenarios, they come together for an after-action report that includes a list of lessons learned – a valuable tool for their next real-life deployment. For example, Texas Task Force 1 search managers developed a chart for tracking search areas and personnel during the first days of responding to Hurricane Katrina.

Parker described the facility as "the most complex and largest in the nation."

"There may be some that are bigger in the land, but none are as complete," he said. "We could have several task forces running simultaneously for 72-hour training sessions, with a different scenario every day. We have that capability and often are close to that capacity."

The activities also increase retention of the lessons learned, and help the participants as they go through recertification or pass the information on to their teams back home, Parker says.

That information retention is essential to the program's success because lives are at stake, McKee said. "We have the combination of all the applied opportunities, but then there's the added power of constant communication afterward," he said. "The difference here is the regular contact, frequent follow-up questions and continuous information sharing. For instance, there was a tornado in London last week and as it was hitting I was getting instant updates on what was going

on. When we share ideas it helps us all. You're not going to find that constant conversation going on anywhere else."

Disaster City's training grounds are extensive, from stories-high rubble piles to mock shopping centers to industrial sites. The buildings include a strip mall, an office building, an industrial complex, an assembly hall/theater, a single-family home and train derailments. Some exercises at the three rubble piles involve running the canine teams through drills or requiring the rescue workers to lift up to 13,000 pounds of rubble with only rudimentary hand tools – the type common on construction sites.

At the technical skills training area, teams work to shore interior and exterior walls, lift and move objects or to breach and break through concrete or steel walls. Other stations emphasize crane operations and trench rescue techniques.

Another area accommodates exercises on chemical and freight train derailments, with plumbing systems that can replicate hazardous materials leaks. A passenger train derailment project features rail cars placed in a realistic configuration.

"We try to expose them as much as possible to 'real world' conditions," Parker said. "These exercises are really built to keep the skills of Texas Task Force 1 honed, but those skills are universal to all rescue workers, so we also offer the sites as training grounds for others. They come from around the world to go through these programs. It's as close as you can get to the real thing."

The connection between TEEX and the United Kingdom dates back to 2003, when TEEX was selected to develop and provide a modified version of its structural collapse course at Disaster City. More than 700 search and rescue specialists from throughout the UK have since trained at Disaster

City. And in July 2005, fresh from responding to the London subway bombing, London Fire Brigade Commissioner Ken Knight said during a press conference that aired on CNN that he attributed his agency's preparedness to the training received at Texas A&M and Disaster City. Members of the London Fire Brigade had spent two weeks at Disaster City for the 80-hour course, which included hands-on training sessions in heavy rescue, structural collapse, structural engineering systems and technical search.

"We had taken the view that it was when rather than if and had a high level of training in place," Knight told CNN. "A number of our firefighters trained at Texas A&M for terrorist . . . anti-terrorist activities...and building collapse. We had taken new equipment and prepared ourselves sadly for this day, and this day was the reality of that training. Firefighters throughout London came through it well."

TEEX uses a "train the trainer" approach, so those who are certified in certain areas can pass the information along.

Brian Locke, director of operational preparedness and resilience with Mercyside Fire Department in Liverpool, said recently – during his fourth visit to Disaster City – that it continues to evolve as a valuable tool for emergency responders.

"You can replicate some of the training modules, and we stolen a lot of those ideas and built them in the UK, but the interchange of ideas between individuals that occurs here, you can't replicate that at all," Locke said. "You don't get that anywhere else in the world, to be trained by people who have actually been in the field. When you're learning in that environment it is so much more relevant and up-to-date. It's a somewhat sterile environment back home, but when you've got someone beside you who has actually been on these disaster sites and they say, 'We tried this and it worked,' or 'That didn't work,' it is very valuable."

Initial talks have been held to share UK and TEEX instructors, and for both to visit on the sites of disasters as they are unfolding. "We're hoping to sign a reciprocal agreement for some people who have been through the training to do short-term exchange visits to assist with training and instruction, and for us to observe alongside TEEX teams on urban search and rescue and swift-water live exercises," Locke said. "It's an excellent opportunity. It's sad that people have to be in distress or lose their lives for us to learn these lessons but



unfortunately, you can't stage every possible scenario. These opportunities – thankfully – are few and far between, and when they do come you have to learn what you can from them. This would allow that to happen almost instantaneously."

Three state-of-the-art classroom and office buildings were recently added inside Disaster City, along with restroom and shower facilities for students.

The nearby 14,000-square-foot Emergency Operations Training Center, which is currently being expanded, is outfitted with computerized training simulation stations. Video and audio feeds allow for active responses to the other areas of Disaster City, while providing active and virtual simulations. There is also adequate space for an urban search and rescue Incident Management Team to set up a functional command post.

Under construction at Disaster City is a replica of the Alfred P. Murrah Federal Building in Oklahoma City, Okla., the site of one of the country's deadliest domestic terrorist incidents until the World Trade Center attacks on Sept. 11, 2001. That April 19, 1995, explosion, dubbed The Oklahoma City bombing, killed 168 people and injured more than 800 others. More than 12,000 rescuers worked the scene, and the lessons they learned there and at other disasters – ranging from the Sept. 11 attacks to Hurricane Katrina – continue to be passed on through TEEX.

The Oklahoma City bombing prompted the idea of Disaster City when Dr. G Kemble Bennett, then director of TEEX and now vice chancellor of engineering for the A&M System, posed the question in 1996 of how Texans would respond if it happened in their state. From that question came one of the world's most extensive, realistic training programs for first responders.

Bennett's initial question led to the federal funding to start urban search and rescue training, and by 1998 Texas Task Force 1 had been established as a statewide urban search and rescue team. Also in 1998, TEEX was designated by the U.S. Congress as home for the National Emergency Response & Rescue Training Center, with Disaster City opening in 2000.

Texas Task Force 1, which is now one of 28 national teams under FEMA, has more than 300





members from 60 organizations throughout Texas. Members include highly trained firefighters, medical specialists, canines and handlers, heavy equipment operators and structural engineers.

Human rescue crews aren't the only ones who receive training at the facility. Disaster City's rubble piles also provide realistic grounds for training and evaluating canine crews with FEMA. The dogs sniff out survivors beneath the rubble, and their human handlers help locate the patients with listening devices and careful exploration. Currently, the scene only accommodates searches of live victims, but Parker said future plans could provide exercises for canine cadaver searches.

In addition to search and rescue programs, TEEX offers courses on homeland security, public works and safety and health, as well as fire training at the world-renowned Brayton Fire Training Field adjacent to Disaster City. The Sept. 11 terrorist attacks increased awareness of the need for training on weapons of mass destruction and terrorism response, and TEEX currently offers more than 20 classes on those areas.

Many of the TEEX courses are offered through open enrollment, and companies and departments can always seek a contract for specialized training. Program organizers work to keep it as affordable as possible, and some participants receive assistance through state or federal funding.

"We can do everything from just accepting a registration to a turnkey operation, where we book the flights and the hotels and arrange for transportation and meals," Parker said. "We're a full-service organization, and we really do focus on customer service. Our best advertising is our students telling others about it, passing on the information they receive and of course coming back for additional training. We want them happy."

Participants in the training program work in

hot, dusty, enclosed spaces to get them accustomed to the conditions they would find at a building collapse. On most of the shoring exercises, they can only use wood because pneumatic tools aren't always readily available in real-world incidents, Parker said. They usually use the tools most common on their own jobs, and sometimes they are reduced to using the most rudimentary tools.

"It's how the pyramids were built, with inclined planes and wedges and pry bars," Parker said. "It is probably the least favorite exercise out here, but most of the people who have gone through say they feel the most prepared from it."

McKee said TEEX is in the "learning curve and assessment curve" phase of adding robots to the training field. "This is new technology in an area that is intriguing to us and could prove to be very valuable," he said. "It's just a matter of making sure the available equipment meets our requirements."

To continue that research, Disaster City has hosted trials of the latest models from private businesses and government entities. Some can "see" victims from an aerial view above the field and some can sense radiation or hazardous materials. Others can scale sides of buildings or lift many times their own weight, such as a car. Then there are "throw-bots," which can be thrown into wreckage, allowing humans to keep a safe distance. Parker describes their maneuvers of scurrying around the grounds as "like rats."

"Our environment is so dynamic no robot can do all of them, but it's great to see what's out there so we can build that aspect into the program," Parker said. "We're adapting off-the-shelf technology to suit our needs. It's exciting to see that part of the program unfold. We're always changing and updating things around here." **IFF**



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Initial and Recurrent Training for ARFF

Highlights of International Differences

By Dan Pierce

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This is part 1, part 2 will follow in the May edition of *International Fire Fighter*. Here the author looks at international training standards for ARFF and in part 1 looks at standards in the USA. Part 2 will cover other countries' standards.

When the alarm sounds and aircraft rescue fire fighters (ARFF) are called to duty, they must use the skills they have learned through experience and training to save lives and to protect property. Because the aviation industry is well regulated, it is a relatively rare occurrence when ARFF equipment is called into action on an actual aircraft accident involving a commercial airliner.

It is most likely that an airport firefighter will work an entire career without having to respond to a large frame aircraft accident resulting in a hull loss or significant loss of life, also known as a mass-casualty incident. It is just as likely that flight crews

operating a large frame commercial aircraft will not be involved in a similar scenario. It is for this reason that airport fire fighters rely on initial and recurrent training to prepare them for a wide spectrum of aircraft emergencies should one occur.

Today's standards used by airport fire departments worldwide for airport fire fighter training have many similarities yet differ substantially. This paper will examine initial and recurrent training conducted by various states contracted to the International Civil Aviation Organization (ICAO) Standards and Recommended Practices. These states/countries are listed in the Supplement to Annex 14, Volume 1, Third Edition.

The International Standard



The international standard most widely accepted for ARFF is written in the ICAO International Standards and Recommended Practices Aerodromes – Annex 14 to the Convention on International Civil Aviation-Volume 1 Aerodrome Design and Operations. ICAO Standards and Recommended Practices for the ICAO Council first adopted Aerodromes on 29 May 1951 pursuant to the provisions of Article 37 of the Convention on International Civil Aviation held in Chicago in 1944. The Amendments to Annex 14 Standards and Recommended Practices for ARFF services were established 9 March, 30 July, and 15 November of 1990. The latest Amendment to Annex 14 (Amendment 4) became applicable on 1 November 2001.

Many states/countries have contracted with ICAO to implement the Standards and Recommended Practices of Annex 14. Where there are differences, they have been identified in the latest Supplement to Annex 14. Many states/countries have given reasons for not being able to comply with these international standards. According to the latest Supplement to Annex 14, no states/countries of the 190 that are contracted to ICAO have indicated that they were *not* in compliance with ICAO ARFF training standards and/or recommended practices.

This is good. This indicates that fundamentally, there are no worldwide disagreements or regulations that prohibit the implementation of ICAO Standards and Recommended Practices for ARFF training.

Annex 14 ARFF Training Information

When we look at the current information for Standards and Recommended Practices identified in Annex 14, we see that the information for ARFF training is very limited.

Section 9.2.34 of Annex 14 states that

All rescue and fire fighting personnel shall be properly trained to perform their duties in an efficient manner and shall participate in live fire drills commensurate with the types of aircraft and type of fire fighting equipment in use at their aerodrome, including pressure-fed fuel fires.

Note 1. – Guidance to assist the appropriate authority in providing proper training is given in Attachment A, Section 16 of this volume of Annex 14; Airport Services

Manual, Part 1; and Training Manual, Part E-2.

Note 2. – Fires associated with fuel discharged under very high pressure from a ruptured fuel tank are known as “pressure-fed fuel fires.”

Attachment A, Section 16.2 of Annex 14 states that

The training curriculum should include initial and recurrent instruction in at least the following areas:

- Airport familiarization;
- Aircraft familiarization;
- Rescue and fire fighting personnel safety;
- Emergency communications systems on the aerodrome, including aircraft related alarms;
- Use of the fire hoses, nozzles, turrets and other appliances required for compliance with Chapter 9, 9.2;
- Application of the types of extinguishing agents required for compliance with Chapter 9, 9.2;
- Emergency aircraft evacuation assistance;
- Fire fighting operations;
- Adaptation and use of structural rescue and fire fighting equipment for aircraft rescue and fire fighting;
- Dangerous goods;
- Familiarization with fire fighter's duties under the aerodrome emergency plan;
- Protective clothing and respiratory protection.

Note – Attachment A does not specify frequency or competency requirements.

ICAO Airport Services Manual – Part 1 Training Information

In ICAO *Airport Services Manual Part 1 Rescue and Fire Fighting Third Edition – 1990*, Doc 9137-AN/898 Part 1 (Amended 14 November of 1995)

Chapter 14 elaborates on the information regarding training found in Annex 14.

In this chapter ICAO has detailed many areas for ARFF training that are significant for an efficient and safe response to an aircraft accident.

Note – ICAO has identified course instruction for airport fire fighter as ICAO course 111. This course of instruction is available in many countries. However the course curriculum and syllabi vary immensely as well as costs. For example here is ICAO course 111 information shown by state/country.

(<http://www.icao.org/anb/peltrg/td/rsltcn.cfm>)

State/Country	School	Course Duration/Tuition
United Kingdom	International Fire Training	6 weeks/\$10,784 U.S.
Indonesia	Indonesia Civil Aviation Institute	8 weeks/\$2,400 U.S.
Netherlands	Netherlands Institute for Fire Service and Disaster Management	Course customized!
United States	Aviation Emergency Response Group	40 Hours/\$500 U.S.
Other ICAO Courses include	112 – Airport Fire Officer (Junior) 113 – Airport Fire Officer (Senior) 119 – Other	

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NFPA Standards



The National Fire Protection Association (NFPA), founded in 1896, has written and published standards also known as NFPA Codes. This organization was instrumental in developing life safety fire codes in the U.S.A. soon after a fire in a nightclub in 1941 (Coconut Grove) occurred that killed 492 people. Various NFPA committees write NFPA codes and standards for ARFF. The international committees of professionals are selected by the NFPA Standards Council with regard to the individuals' knowledge, experience and expertise in aviation fire fighting. Today the NFPA's comprehensive Codes and Standards are widely accepted in the United States and are becoming more popular on an international basis as well. The Federal, State, Municipal or private authority having jurisdiction (AHJ) must adopt NFPA Codes. Many ARFF departments have adopted NFPA Standards for training. The NFPA Standards used for ARFF training include:

- *NFPA 405 – Recommended Practice for the Recurring Proficiency Training of Aircraft Rescue and Fire-Fighting Services-1999 Edition*

This NFPA document has recently been upgraded to a standard that provides detailed information on ARFF recurrency training. NFPA 405 could be used to supplement existing ICAO Annex 14 Attachment A recommendations.

- *NFPA 1003 – Standard for Airport Fire Fighter Professional Qualifications-2000 Edition.*

This NFPA Standard details initial ARFF training requirements.

Only recently, the NFPA has been able to add a staffing level requirement to the appendix of one of its documents *NFPA 403-Standard for Aircraft Rescue and Fire-Fighting Services at Airports-2003*. Typically, airport management will only provide the minimum requirements required by ICAO standards and recommendations or aviation authority regulations. Staffing plays an integral role in training and ARFF response. Many of the larger airports in the country recognize this need and attempt to staff ARFF equipment at higher levels that are not based solely on federal ARFF equipment index requirements.

International Fire Service Training Association (IFSTA)



The International Fire Service Training Association (IFSTA) was established in 1934. It is an entity of Oklahoma State University in the United States of America. IFSTA is a non-profit organization dedicated to upgrading firefighting techniques and safety through training. They have produced fire service texts providing essential curriculum for ARFF training. One of the most current publications, *Aircraft Rescue and Fire Fighting-Fourth Edition* (ISBN 0-87939-192-8) published by Fire Protection Publications, is a comprehensive text used by many progressive departments worldwide as an essential training reference for ARFF.

Different States, Different Training Standards

Although ICAO has gone to great lengths to provide a basic international standard that is

comprehensive enough to provide vital information for ARFF training, many states/countries/cities have deviated from these standards one way or another. Some ARFF departments have included all of the ICAO Standards and Recommended Practices as a minimum part of their overall training program while others have omitted these Standards and Recommended Practices to suit their departmental training agendas. Some states/countries (authorities having jurisdiction-AHJ) have adopted all or in part, NFPA Codes. Lets take a look at some of the differences in ARFF training standards in different states/countries.

United States of America



In the United States of America, the authority having jurisdiction (AHJ) over all of the certificated airports (airports that fly scheduled flights with aircraft that have more than 30 seats) where on- airport ARFF protection is required, is the Federal Aviation Administration (FAA). The FAA has adopted the ARFF training recommendations of ICAO found in Annex 14, Attachment A, Section 16.2 (See Above) in Federal Air Regulation (FAR) 139.319.

All certificated airports use this FAR for minimum ARFF training requirements. Many airports have supplemented this training requirement using NFPA 405 as a standard for recurrent training. Some departments use NFPA 1003 for an initial ARFF training standard. There seems to be what I will call a "Cafeteria" effect that is prevalent in the U.S. ARFF departments will pick and choose different standards, like assorted food items at a cafeteria, to suit their needs using FAR 139.319 as a minimum standard. IFSTA ARFF standards are commonly referred to for training. The FAA only cares to check that the federal regulation FAR 139.319 is in compliance.

Regarding training fires for ARFF in the U.S., it must be noted that most of the ARFF crews are now training at propane training facilities to complete an annual FAR 139.319 requirement for live training fires. There is much controversy as to the quality of training received at these facilities. The FAA certifies some of them while others they do not. The intensity and quality of training varies widely between facilities. The cost for this training is also a factor. While propane has proven to be a more economical and environmentally efficient fuel to produce a useful ARFF training environment, it is not a good substitute to simulate hydrocarbons in the hostile environment encountered at an actual aircraft accident. Many of today's ARFF crews that train only with propane will not be familiar with how hydrocarbons behave when burning at an aircraft accident. The BTUs released as heat is lessened while smoke generation is significantly decreased. Practical training of foam application is compromised. This lack of training with hydrocarbons may compromise firefighter safety and effectiveness from improper agent application. Propane training neither satisfies the requirements of ICAO Annex 14, Chapter 9, 9.2.34 regarding extinguishment of a pressurized fuel tank fire, nor NFPA 1003 Section 3-3.4 for initial fire training with hydrocarbons.

FAR 139.319 is vague in the respect that it does not indicate standard levels of competency,



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training frequency, duration of training and training curriculum. It does not mandate a record-keeping format for ARFF training. FAR 139.319 only mirrors the basic categories of training found in ICAO Annex 14, Attachment A. The U.S. FAR does add an additional requirement for a single person trained in basic emergency medical care to be on duty during flight operations. Many individual states in the U.S. have established certification criteria for airport fire fighters.

Certificated airports in the U.S. are also required to demonstrate their ability to comply with the FAR required Airport Certification Manual by conducting an annual ARFF response and a triennial exercise that tests the airport's ARFF response and Airport Emergency Plan (AEP).

The FAA has recently distributed a three-CD set for computer based training to certificated airport fire departments. The CD set covers all of the required training mandated in FAR 139.319 and much more. The FAA has set has a precedent by



using computer technology to elaborate on standards established in FAR 139.

A U.S. Aviation Regulatory Affairs Committee (ARAC) has been formed in the U.S. to try and work with the FAA in updating

the existing FAR 139 to more comprehensive training and operational standards. To date the committee has been ineffective in getting the FAA to make any changes for ARFF training. The current problem seems to be that the FAA has difficulty passing any new regulations that would be economically acceptable for all certificated airports. This enables the current U.S. regulation to be mostly in conformance with ICAO standards, and economically flexible enough for the smallest of certificated airports (Index A) to be in compliance with the FAR.

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ICAO Attachment A

U.S. FAR 139.319

- | | |
|--|-------------------------------|
| a.) Airport Familiarization; _____ | ➔ (2)(i.) |
| b.) Aircraft familiarization; _____ | ➔ (ii.) |
| c.) Rescue & fire fighting personnel safety; _____ | ➔ (iii.) |
| d.) Emergency communication systems on the aerodrome including aircraft fire related alarm; _____ | ➔ (iv.) |
| e.) Use of fire hoses, nozzles, turrets and other appliances required for compliance with Chapter 9, 9.2; _____ | ➔ (v.) |
| f.) Application of extinguishing agents; _____ | ➔ (vi.) |
| g.) Emergency evacuation; _____ | ➔ (vii.) |
| h.) Fire fighting operations; _____ | ➔ (viii.) |
| i.) Adaptation and use of structural rescue and fire fighting equipment for aircraft rescue fire fighting; _____ | ➔ (ix.) |
| j.) Dangerous goods; _____ | ➔ (x.) Aircraft cargo hazards |
| k.) Familiarization with fire fighters' duties under the Aerodrome Emergency Plan; and _____ | ➔ (xi.) |
| l.) Protective clothing. _____ | ➔ Deleted |

(3) All rescue and firefighting personnel participate in at least one live-fire drill every 12 months.

(4) After January 1, 1989, at least one of the required personnel on duty during air carrier operations has been trained and is current in basic emergency medical care. (40 Hrs.)

Standards for other countries will follow in the May edition of *International Fire Fighter*.

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Devon Fire & Rescue Service Breathing apparatus training in Colombia

In 1998 the current CFO of Devon Fire & Rescue Service Paul Young intercepted a call for help that was posted in an International magazine by a concerned ex-pat living in Colombia in South America. He had witnessed a fatal domestic fire in the country and being used to the UK's high standards of emergency response was puzzled as to why the tragedy had taken place.

After initial communication with the gentleman and subsequently the Colombian Fire Service it was agreed to send an officer from Devon to carry out a 'scoping' visit to establish what assistance could be given.

As a result of his investigations it transpired that a lack of cross border co-operation, command and control and training were the main causes.

The Colombian disaster response organization (CREPAD) that is responsible for the co-ordination of the emergency services, including the Red Cross, Civil Defence, Ambulance service and Fire Service, agreed that there were a number of improvements that could be made and asked for our continued assistance.

Soon after this initial visit the region of Colombia concerned suffered a devastating earthquake

that decimated much of the infrastructure and importantly from our point of view the existing Fire Stations and many first line (although ageing) fire appliances.

As a result a large quantity of material aid was accessed from a number of sources in the UK and subsequently sent to the Country including surplus fire kit, fire appliances, Land-Rovers and trailer pumps and latterly a Green Goddess appliance particularly suited to rural, mountainous areas, donated by central government.

There followed a number of visits to Colombia over a five-year period to provide training and expertise, including familiarization training with the UK pumps and equipment, the training of general fire-fighting instructors and the provision of fire investigation and arson prevention training.



In addition, after long and patient negotiation with the Ministries concerned, assistance with the structure and set up of a new Fire Inspectorate was achieved.

During 2003 a large number of surplus MOD breathing apparatus sets were accessed by Devon and then donated to the region of Caldas with the intention of distribution of the sets to stations in the area with little or no BA capability. The intention was then to provide basic BA training prior to the sets being put 'on the run'.

This process was initially delayed but finally took place recently during September 2006 when two Devon Fire Officers travelled to the City of Manizales in the region of Caldas.

Former Station Officer Peter Sandel (currently a consultant Fire Investigation Officer) and Leading Fire-Fighter Paul Furler (an operational Crew Commander and Fire Behaviour Instructor) had both delivered training in Colombia on a number of occasions and had retained communications with colleagues at the "National System for the Prevention of Disasters" in Colombia. They had both received a number of requests to assist with training since the last visit to the country in 2003 and when funding became available from the National System they agreed to make the journey.

Manizales is situated in the West of Colombia in the mountainous Cordillera Occidental. At 2,150m above sea level it is in the shadow of the only active Volcano, Nevado del Ruiz, in the Northern Andes Mountains. It is a vibrant city of 300,000 people with a wide variety of buildings from the traditional timber/bamboo construction to modern 'high-rise' apartment blocks and is in a period of rapid development.

The city has 3 fire stations, 2 being manned by full time firefighters and the other by volunteers. The design of the appliances and equipment as you would expect is heavily influenced by the Country's proximity to the USA and

it was interesting to witness first hand that with the consistency of the climate the two man cabs, with everyone else 'hanging on' around the appliance, are in many ways practical and well suited to the country, (although I am not sure what our European H&S legislators would make of them!)

Fire fighters from all over Colombia took part in the 3 breathing apparatus and fire behaviour courses and 3 Fire Investigation and Arson Prevention seminars during this latest visit.

Our Colombian colleagues were keen that the course content followed UK safety standards with regard to the BA training, with which they have been highly impressed in all aspects of our training over the years. Prior to our visit, there were no BA control procedures in place to ensure the safety of personnel in an area of risk in Colombia.

We were also interested to find that BA is not worn on many occasions operationally that we would consider essential in the UK. This is the case for a variety of reasons, not least of which being the lack of resources and a culture of fighting the fire from outside the building. We were also interested to learn that many of the very experienced officers who attended at Manizales had not received any structured initial or continuation training with breathing apparatus in their careers. In the light of this it was no surprise that we experienced hesitancy at first, particularly during the practical element of the training. This was on all occasions replaced very quickly with the usual Colombian enthusiasm and willingness to learn that we have become used to, once the safety aspect of the procedure was fully understood.

The city currently has no training facility and so the first two courses were held at a local catholic seminary on the outskirts of the City and the last at the main Manizales station in the heart of the City, both venues had excellent lecture facilities. The practical training took place in the buildings concerned and in fresh air using obscuration masks and/or cold smoke and although this was an effective way to instill the necessary 'safe person concept' with regard to the wearing of BA, it was recognized by our colleagues that they are in desperate need of a training facility, and ideally one to carry out realistic hot fire training.

The 5 day breathing apparatus courses were designed to follow a basic initial BA wearer format with technical input in the lecture room being delivered with the able assistance of two rare



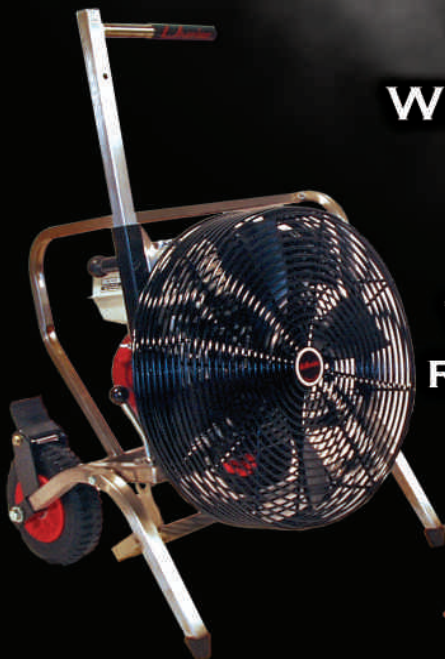
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After set familiarization and initial confidence building exercises to demonstrate that the 'Siebe' sets, although short duration, basic and far from state of the art, would deliver well in excess of the demands of all the fire fighters that were trained. Working duration tables were created for the sets and eventually all aspects of the procedure, including 'rapid deployment', stage 1, stage 2 and main control were demonstrated and practiced with guide lines being used as a good training aid to keep control of the large number of wearers being trained at any one time.

A number of case studies were used to highlight the need for all firefighters to understand the theory of fire behaviour and to recognize the signs and symptoms of potential Backdrafts and Flashovers. A practical demonstration under controlled conditions being impractical, video footage of practical training at Devon's Breathing Appa-

tus and Fire behaviour centre at Exeter Airport was used as illustration, although it was possible to demonstrate and practice the requisite branch techniques, door entry and Search and rescue techniques practically.

This final day of the course concluded with a search and rescue, scenario based exercise to incorporate all aspects of the course in cold smoke in the accommodation block of Manizales station 2.

The result of the visit is that following consultation with the CREPAD coordinator and the area Fire Officers a Colombian version of our BA procedure will be implemented in Caldas in the very near future.

As the construction of buildings continues more and more to resemble those of Europe it is recognized that compartment fire fighting will increasingly be more of an issue in the Country, with the inevitable consequence of potential backdrafts and flashovers.

The Colombian Fire Service is particularly keen to introduce continuation fire behaviour training, to include hot fire training. To further facilitate this two Colombian Instructors will travel to Devon during May 2007 to view Devon's BA & fire behaviour-training unit at Exeter first hand.

Ultimately the Colombian Fire Service, with Devon's help, would like to provide their own BA & Fire behaviour centre in Manizales, Caldas to deliver quality training, based on the Swedish Fire Service (Raddnings-Verket) model to their fire-fighters, and then to cascade similar 'center's of excellence' across the country.

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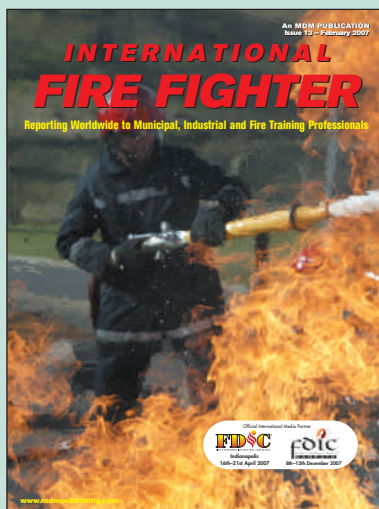
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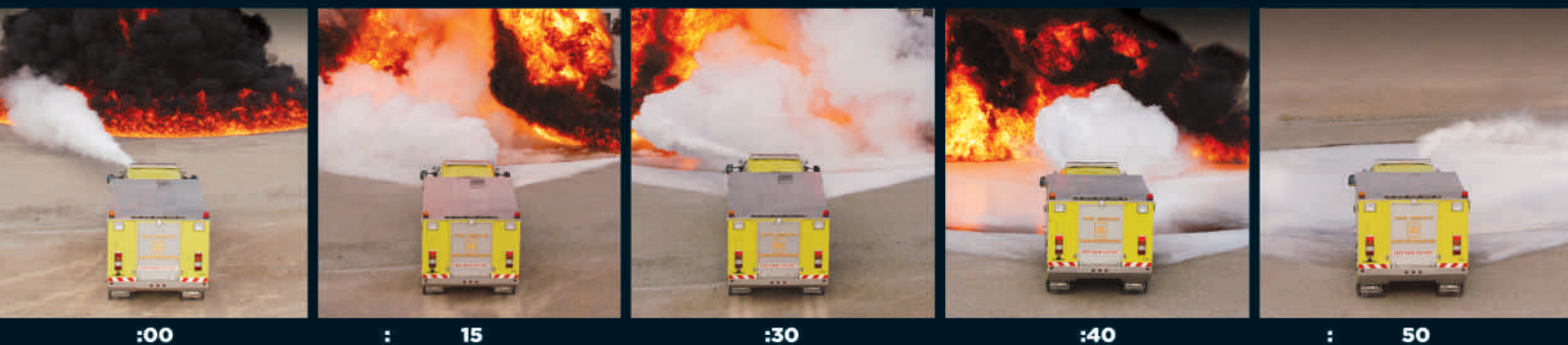


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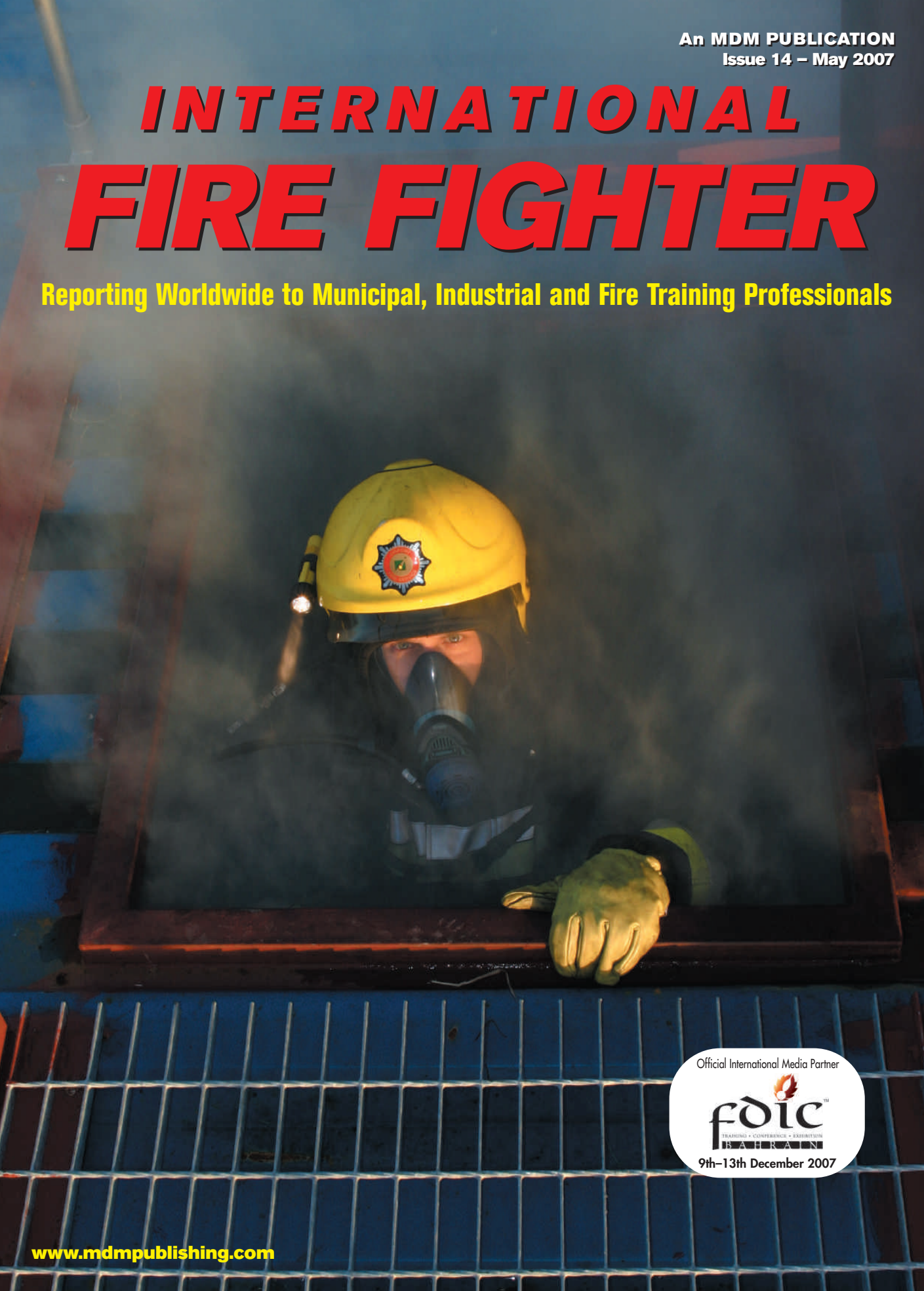


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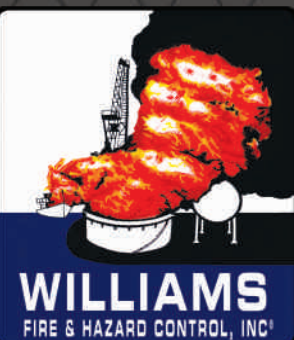
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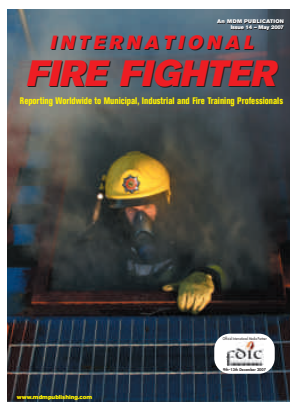
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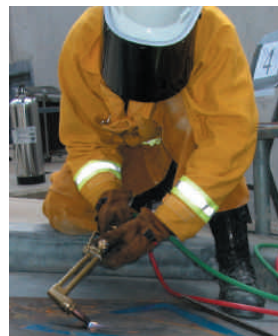
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Unifire Force50™ Monitor Tested & Purchased by Denver Fire Department's International Airport Division

The Denver Fire Department's International Airport Division, under the direction of Chief Nick Nuanes, is purchasing its first "Force50" stainless steel 316, remote-control "Force50" monitor manufactured by UNIFIRE AB of Sweden. The Division is responsible for Aircraft Rescue Fire Fighting (ARFF) at the Denver International Airport. A total of 87 fire fighters at DIA are trained in Aircraft Rescue Fire Fighting and the Department maintains 11 support vehicles and 16 pieces of emergency apparatus.

The Department's decision to purchase the Force50 monitor comes after its rigorous testing by the Department and 92 firefighters, each of whom independently tested and evaluated the Unifire Force50 monitor and ranked its performance against other turrets they have used. The evaluations, headed by Doug Mangels, showed impressive results of the Force50's comparative performance, as follows:

The shiny, stainless steel Force monitors have recently debuted in the United States and are featured on the popular 65' Snozzle® by Crash Rescue Equipment Services, Inc. (the U.S. Distributor for Unifire AB). Unifire reports that its global sales of the monitors are growing rapidly, and they currently project an increase in monitor sales of at least 60% in 2007.

The Force monitors feature a CANBUS control system with advanced electronics capable of customization to their customers' needs. The joystick is progressive, allowing the operator to precisely control the monitor's speed of motion depending on how hard the joystick shaft is pressed in any given direction. The nozzle's spray pattern can also be controlled infinitely from jet to fog



with a convenient dial on the joystick. The joystick has a valve operation button and a "park" button for one-step, programmable bedding of the monitor after operation. The high-quality control cables feature multi-connectors for simple installation. The monitors' motors are completely sealed in stainless steel, unscrew-able canisters, which fully protect the motors from exposure to the elements and allow instant access to the motors for inspection or replacement, if necessary. The motors themselves feature snap on/off multi-connectors. The Force50 with nozzle weighs just 41 pounds (18.5 kg). This turret has a 2" pipe diameter with an optimal maximum capacity of 525 gallons per minute at 145 psi (2000 lpm at 10 bar). The larger Force80 with nozzle weighs only 66 pounds (30 kg) and has a 3" pipe diameter with an optimal capacity of 1450 gpm at 145 psi (5500 lpm at 10 bar).

For more information contact:
Roger Barrett James, Unifire's Director of International Sales and Marketing
Tel: 1 (310) 933-5919
Email: roger@unifire.com

UNIFIRE FORCE50 MONITOR COMPARED WITH OTHER TURRETS USED:

Rating Category	Better	Far Better	Same, Better or Far Better
OVERALL RATING	51%	27%	93%
Ability to Adjust Nozzle Stream Pattern	40%	47%	95%
Ability for Second Person to Operate the Monitor	42%	39%	96%
Ability to Start Operation	29%	13%	85%
Ability to Pump & Roll	37%	10%	87%
Ability to Control Nozzle Stream Pattern During Pump & Roll	39%	29%	84%
Ability for Driver to Operate	33%	5%	63%
Ability to Bed/Park After Operations	34%	18%	86%

Source: Doug Mangels, Denver Fire Department DIA

Angus Fire Endorses EuropAid Initiative at Fire Industry Conference



In a presentation at this month's Fire Across Europe Symposium, ANGUS FIRE spoke in favour of European Commissioner Michel Barnier's recently proposed EuropAid initiative, which calls for the creation of a European civil protection force. Held at the British Houses of Parliament and organized by the Federation of British Fire Organisations (FOBFO), the Symposium was attended by over 100 senior fire professionals from across Europe. Angus Fire is part of UTC Fire & Security, a unit of United Technologies Corp. (NYSE:UTX).

During the presentation, Alec Nightingale, Managing Director of Angus Fire, emphasised the need for a European wide fire fighting strategy to address major incidents like the Buncefield fuel depot fire in the UK, the Repsol Refinery fire in Spain and the Idemitsu Refinery fire in Japan. He cited all three as examples of recent major incidents during which initial planning measures did not match the scale of the actual event or the true risk potential.

He also said that, "Angus Fire has always been committed to developing products and services of the highest quality. We support the Fire Trade Associations and Standards bodies at both the national and international level in order to promote excellence and best practices wherever possible. A unified European fire fighting approach will only be achievable through the continued collaboration among the major fire safety organisations and Angus Fire is fully prepared to support this initiative."

The aim of FOBFO is to achieve a safer Europe by encouraging knowledge sharing and fire fighting experience. Since 1962 FOBFO has been presenting the views of all major fire organisations in the UK to national and international audiences including CTIF (International Technical Committee for the Prevention and Extinction of Fire), a worldwide body with membership from 52 countries.

Angus Fire has been supplying fire fighting equipment around the world for over 200 years. Today it is part of UTC Fire & Security, which provides fire safety and security solutions to more than one million customers throughout the world. Headquartered in Connecticut, USA, UTC Fire & Security is a business unit of United Technologies Corp., which provides high technology products and services to the building and aerospace industries worldwide.

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SAVOX – More safety, more efficiency

The integrator of safety and communication equipment also offers turn-key product development

SAVOX Communications is a leading innovator and designer of communications solutions for safety apparel and equipment. Our products are used by military, police, fire, rescue, and industrial professionals. Building on our unique expertise, experience and market knowledge, we offer our portfolio of SAVOX Communications products as well as complete design and product development projects – from idea to production.

SAVOX Communications is a design-oriented company that brings innovations to commercialisation. We are guided by the need to meet the safety challenges of hazardous work through product development. Accordingly, the company name – a composition of the words “save” and “vox” (sound) – originates from our initial product, a firemen’s breathing mask with integrated communication features.

Communication is the basis for safety and efficiency

Military, police, fire, rescue, and industrial professionals carry out their tasks in demanding circumstances. Their personal safety, team safety and organisational efficiency are challenged and measured every minute.

SAVOX Communications is a provider of advanced communications solutions for safety apparel and equipment used in hazardous jobs.



Mask-mounted bone-conductive communications system as supplied to a number of UK fire brigades

produce integrated safety and communication equipment. Similarly, becoming a worldwide operator before the Internet age was a massive growth challenge. Now, with distribution through global players, less than two percent of our business is domestic. Our key markets are Europe, North America and Australia.

Over the years, SAVOX Communications has achieved numerous world’s firsts in safety and communication applications – including the breathing mask communication system, the bone conduction helmet microphone, the hearing protection earphone, and the throat microphone. Since 2001, we have offered the widest range of products in our chosen markets.

Constant progress towards a safer future

Securing safety and efficiency in demanding circumstances requires dependable equipment that enables constant communication. More and more, verbal communication will be supported by other kinds of data such as positioning information, and telemetric and biometric readings. New radio technologies will be utilised to enable versatile communication. The more data can be transmitted, the more informed the decisions in pressure situations will be, making everyone’s jobs safer and more efficient.

“Precise” and “reliable” are the attributes said to characterise both us and our products. It is our goal to keep living up to this perception as we integrate new technologies into our safety concept. Therefore, we invest systematically in operational and design excellence. We constantly evaluate our training schemes, technology innovations, raw materials and service capabilities to offer unrivalled quality to our clients.

If you want to hear more about leading safety and communication solutions, call or email either Jussi Havakka (jussi.havakka@savox.com) or Aku Salmi (aku.salmi@savox.com) on +358 9 417 411 00

With a 25-year track record and several world’s firsts in design and product development, we hold a recognised position in the industry. Our products are distributed by market leaders in the various fields of safety and communications.

Today, we also offer comprehensive product development, design and manufacturing services to companies seeking to integrate world-leading technology into their products.

Resources for exclusive design and manufacturing

Special communications networks enable a two-way connection in combat and emergencies, during unrest, or in extremely noisy conditions. Their effectiveness is significantly enhanced by microphones, speakers and wires integrated into helmets, ear protection, clothing or other apparel. Designing these applications for the most demanding clients is our speciality.

The strengths of SAVOX Communications include compatibility with a wide range of



SAVOX® C-C500 is a multi-purpose remote speaker-microphone that can also be used without a headset thanks to its internal microphone and speaker.

A compact, lightweight helmet-com unit for professionals working in extreme and hazardous conditions, SAVOX® HC-1 provides instant, clear and reliable “hands-free” communication.



products, achieved through close co-operation with manufacturers of radio and safety equipment. We also prioritise usability in our designs – for example, the special design of our push-to-talk units prevents any unintentional transmission even when operated under protective clothing. SAVOX Communications also has strong expertise in intrinsic safety and ATEX-approved products (see sidebar).

A proud tradition of groundbreaking innovations

Taking the unbeaten path, SAVOX Communications was the first company to

BARIE to enhance firefighters’ communication

SAVOX Communications’ expertise in intrinsic safety and ATEX-approved products has not gone unnoticed by the FES industry. In 2005, co-operation between SAVOX Communications, Interspiro Ltd and Radiocom Systems Limited led to a range of breathing apparatus radio interface equipment (BARIE) to be included in the Tendered Firebuy Procurement Programme.

As Wayne Shillam from Interspiro says, “This contract has allowed the co-operating companies to meet the communication system requirements of each brigade. Due to a large equipment purchase volume, the UK Fire Service has benefited from the framework agreement. London, Staffordshire, Derby, Warwickshire, Northumberland and Shropshire Fire Rescues are just some of the brigades benefiting from the Firebuy agreement”. Both Wayne Shillam from Interspiro and Mark Blythe from Radiocom can be met at the Fire & Rescue Show at the NEC in Birmingham on May 22 – 24.

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THE SNOZZLE® may be the best kept secret in the fire industry. It affords the fire department a lower cost alternative to the aerial ladder, while allowing you to carry more water and have more compartmentation than a standard aerial device. A large rear compartment (or rear mounted pump) and an unrestricted hose bed are features of the midship mounting of the Snozzle®. Flow capability of up to 1500 GPM (5,600 LPM) is available. You have the

of the fire scene. A piercing nozzle is available for interior fire fighting of metal buildings, attics, dumpsters and automobile fires, to make the fire fighting package complete.

The light weight of the unit allows single axle chassis and lower Gross Vehicle Weight Rating (GVWR). It only requires approximately 21" of linear chassis area to mount and in most cases that allows for a compartment on each side of the Snozzle®.

Staging is no problem, since the jacks only extend to a total width of 12' 5" (less than 4 meters). This allows the unit to be set up in many areas where a standard aerial would not be an option. The time required to set up this unit is also substantially less than other aerial devices. It is often on the



scene and operating while other units are still being set up. The combination of articulating and telescoping booms further enhances maneuverability. The Snozzle® can be set up and operated in narrow alleys or tree lined streets.

The next time you have an aerial need; don't overlook the Snozzle® option.

Further information from:
Crash Rescue Equipment Services, Inc.
www.crashrescue.com



range of 65 ft. (19 meters) of elevation down to 12 ft. (9 meters) below ground level. Radio remote controls are standard allowing for operation up to 300 ft. (100 meters) away from the vehicle. This gives the operator a unique perspective of where the fire stream is going. As added assistance, a thermal imaging camera and/or a color camera with a weather proof monitor is available. The cameras are located on the nozzle to give the operator an elevated view



Comfort and flexibility of new Cromwell on show

Specialised Fire and Rescue Helmet on Stand FR311 at Fire and Rescue Show 22-24 May 2007

The comfort levels and flexibility of the HELMET INTEGRATED SYSTEMS LTD (HISL) Cromwell dual shell helmet will be displayed and demonstrated at the Fire and Rescue Show, being held at the NEC from 22-24 May 2007.

Exhibiting on Stand FR311, HISL will be showing the new Cromwell ER1-FR2 advanced technology dual shell, fire and rescue helmet, which enables the wearer to select the helmet option that best suits the operational requirement.

The ER1 Emergency and Rescue helmet, complete with adjustable headband and retractable visor, weighs 800gms and is suitable for fire service operations which do not require a structural fire-fighting helmet. The ER1 can also be used by paramedic, water rescue and civil defence personnel, and can be configured for specialised operations such as heli-deck, coastguard, air sea rescue and public security.

The Cromwell FR2 consists of the ER1, plus an outer shell with integral full face shield, which is fitted in seconds by means of an internal clip arrangement. The FR2 provides additional heat, flame and impact protection to the wearer when undertaking structural fire fighting operations.

The new Cromwell has been designed so that there are no connections on the outside of the helmet that are susceptible to impact damage or heat load.

Options available include hearing defenders, integral communications, neck capes and SCABA facemask fixing points.



The ER1-FR2 Cromwell helmet is manufactured using the latest moulding techniques and materials, and has been developed to be offered as part of the PPE ensemble of the UK Firebuy Integrated Clothing Project (ICP)

HISL, based in Hertfordshire, is ISO 9001 approved. It has supplied many of the UK Fire Services with its range of Cromwell fire helmets and is the leading international supplier of helmets for military and civil aircraft.

Further information can be obtained from:
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Helmet Integrated Systems Ltd

Tel: + 44 (0)1462 478000 or
+44 (0) 7766 476819

Mark Broughton

Marontech Communications

Tel: +44 (0)1428 647979 or
+44 (0)7880 506345

Fire Department Instructors Conference returns to Bahrain



The Ministry of the Interior (Bahrain), PennWell Corporation, Bahrain Exhibition and Convention Bureau (BECA) and the General Directorate of Civil Defence Bahrain (GDCC) announce the return of the Fire Department Instructor's Conference Bahrain (FDIC Bahrain) to the Bahrain International Exhibition Centre from 9th to 13th December 2007.

May 2006 saw the first ever Fire Department Instructor's Conference to be staged in the Middle East, and the inaugural FDIC Bahrain was an immense success for the development of skills and training for the regions fire industry.

FDIC Bahrain is being organized under the patronage of H.E. Sheikh Rashid bin Abdulla Al Khalifa, Minister of the Interior. The event enjoys high-level support from both within the government of the Kingdom of Bahrain as well as from the industrial sector. The Ministry of the Interior and through this the General Directorate of Civil Defence under the leadership of Major General Abdul Latif Al Zayani has pledged his full support. From the industry, FDIC Bahrain also enjoys the full support of BAPCO, the Bahrain Petroleum Company, and Arab Shipbuilding and Repair Yard (ASRY) Bahrain.

FDIC Bahrain helps fire-fighters in the Middle East save lives in three key areas: experience, knowledge and equipment.

FDIC Bahrain 2007 builds on the success of the first event, aiming to provide training in real situations, including refinery fires, structural fire-fighting, marine fires and vehicle extrication.

Hands-On Training modules

Hands-On-Training (H.O.T.) modules give fire-fighters real, live training under the guidance of some of the most experienced fire-fighters in the world. In carefully selected venues located throughout the city, fire-fighters will learn techniques and practical theory on a range of live emergency situations.

Workshop Sessions

Workshop sessions provide extended case study learning in a range of scenarios. Each 3 hour Workshop aims to tackle an emergency scenario, from tall buildings in the construction industry, to industrial and marine fire-fighting.

Conference

The conference provides classroom based learning that gives fire-fighters and fire industry related professionals the most up-to-date knowledge on how to fight fires. With 20 conference presentations covering various fire issues, by some of the world's leading industry professionals, the conference has something to offer all levels of fire personnel.

Exhibition

FDIC Bahrain also offers an opportunity for companies to showcase their products that enable fire-fighters to do the job that they do and which keep them alive while they are doing it. Leading international organizations will be exhibiting their products and services at FDIC Bahrain exhibition Hall 1 in the Bahrain International Exhibition Centre.

FDIC Bahrain is a 5 day event, that will see over 20 speakers and with leading fire industry trainers providing Hands-On-Training at 8 different locations.

The training programme has been developed under the guidance and leadership of former United Nations Fire Chief Robert Triozzi, leader of the Rome based Fire Rescue Development Program, a UN recognized Non Governmental Organization (NGO). Chief Triozzi, a 30-year fire service veteran, has worked with fire-fighters in nearly 40 countries and has the distinction of recognizing, training and guiding fire services in developing and war torn countries, including Bosnia, Angola, Kosovo and Iraq.

Co-Leader is John O'Connell, Lead Instructor at the FDIC events in the USA, as well as a fireman of 26 years experience with the Fire Department of New York (FDNY), one of the busiest fire departments. John was the most experienced elite 'Rescue' fireman in the city until his retirement.

The Fire Department Instructor's Conference Bahrain is organized and run by PennWell Corporation, and co-organized by the Bahrain Exhibition and Convention Authority. PennWell Corporation runs the equivalent Fire Conference and Exhibition in the USA, attracting over 25,000 attendees, with an entire week of Conference and Hands-On-Training programmes.

Jeremy Richardson, Event Director for FDIC Bahrain, said, "It is fabulous to see the return of The Fire Department Instructor's Conference to Bahrain. We are delighted to, once again, see the support of the General Directorate of Civil Defence, BECA and companies such as Bapco and ASRY."

"FDIC Bahrain will see the key decision makers, buyers and influencers at the event, as well as the municipal and industrial fire-fighters that put their lives at risk to save others. We aim to ensure that The Fire Department Instructor's Conference provides the fire industry with the best training achievable to help the fire-fighters tackle dangerous situations as safely as possible."

Further information on The Fire Department Instructor's Conference in Bahrain (FDIC Bahrain) can be found by visiting www.fdicbahrain.com and from Neil Walker, Marketing Manager, PennWell. Tel: +44 (0) 1992 656 643. Fax: +44 (0) 1992 656 700. Email: neilw@pennwell.com

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Malcolm Hannon took an early retirement from being a sales director for Southcombe Brothers, to form his own consultancy business, PPE Safety Solutions, working with proven quality suppliers, Stedfast Inc., Eagle Technical Fabrics/Products, and Europrotect, they each will fulfill a vital role to provide the best available personal protective wear, and up to date technology to manufacturers/fire brigades/police forces, and utility companies.

STEDFAST INC., a premier supplier of innovative multiple textile coating and laminating for specialized end users, is now bringing its unique technology to the UK PPE market.

Founded in 1930, Stedfast Inc. is now the market leader in creating coated and laminating fabrics. Stedfast Inc. serves the material-to-specification needs of military, medical, industrial, marine, and protective clothing fields.

Products include Neoprene, kevlar, and Polyvinyl Chloride products and laminated breathable moisture barriers. Stedfast Inc. offers a highly skilled technical team, state-of the-art research and testing facility, clean room facility, and utilizes environmentally responsible business practices.

Stedair moisture barriers are produced in their own plants, located in Charlotte NC, and Granby QC, to provide exceptional durability, TPP and THL ratings, and go above and beyond the EN469, EN659, and NFPA specifications set for fire fighting and EMS clothing for the European and the North American Market. Certified products include, Stedair 2000, Stedair 2000e, Stedair 3000, Stedair 4000, Stedair 123, Stedair 194, Stedshield FR and stedprene FR. visit them at www.stedfast.com

EUROPROTECT FRANCE, a European leader in research and development, offers a range of innovative fabrics for personal protective apparel. They are also fully integrated as spinners, weavers, dyers, and printers.

Their fabrics are tailored for numerous areas of activity, fire fighters, utilities, hospitals, armed forces, institutional users and police forces. Their strategy focused on research and development, gave rise to patented products designed for specific niches, providing technical solutions for customers individual needs in terms of safety and comfort.

Europrotect have 2 unique fabrics manufactured in accordance and tested to EN469 for fire fighters tunics, one, for outer shell wear – Twin

System – and the second for thermal insulation, Twin spacer.

TWIN SYSTEM is a technology which enables the mechanical performance of any fabric to be increased considerably, without affecting its look or weight.

TWIN SPACER is a technology whose performance is already recognised by many users. It makes it possible to produce a lightweight fabric with two operating sides providing excellent thermal insulation through an air-circulation system. visit them at www.europrotect.fr

EAGLE TECHNICAL PRODUCTS was founded in 2000, to service the needs of the Emergency Service Workers, ie; Fire, Police, and Utilities, who require the highest level of service and protection available from their protective clothing.

In terms of Fire Fighting, Eagle specialize in Fire Fighting Hoods to EN13911. They are available in Pbi Gold, Carbon X, Kermel/Lenzing FR and P84/Lenzing FR. They have a variety of specialist styles with the most popular designs, ETF2, and ETF20. Both the fabrics and finished hoods are to registered designs.

Included in their range of products they also manufacture moisture wicking base layer T shirts and Long Johns to EN531, offering Kermel/Lenzing FR and Protex/Cotton.

Their latest range of products they have introduced to the market feature an extensive range of Fire Fighting Gloves, manufactured in accordance to EN 2003. These gloves offer the highest levels of protection, with a unique pre-curved finger design to offer dexterity to the whole hands, an essential requirement for the modern fire fighter.

Included in the range are Structural Leather Fire Fighting Gloves, Ref. ETF309, USAR Gloves, Ref. ETF319, Debris Glove Ref. ETF329 plus an economy range of aramid fire fighting gloves. Visit them at www.eagletechnicalfabrics.com

IFF

Should you require further information, or help in co-ordinating your PPE needs, please contact:
Malcolm Hannon
Tel. 07810351746 or
malcolm.hannon@virgin.net

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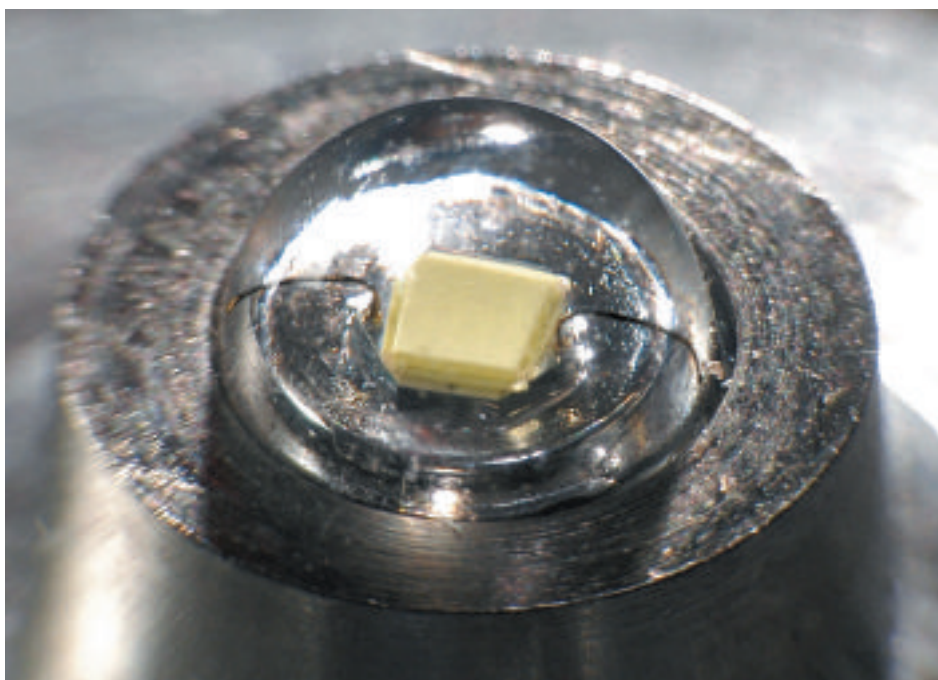
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LEDs: The Evolution and Revolution Of A Small Plastic Bulb

By Greg Kang

Engineering Manager,
Pelican Products

Since the dawn of man, fire and light have beaten away the dark. A lit torch meant the difference between living and falling prey. Ever since Edison invented the light bulb, flashlights, like all technology, have progressed from a simple momentary torch to a sophisticated lighting instrument, integral to safe plant operations. Imagine being in a blackout without a flashlight? Activity on the assembly line, in the lab, or in a burning building interrupted by a failing flashlight can be problematic at best and life threatening at worst.

The incandescent bulb was once the preferred way to light a flashlight but in the last 15-20 years, LEDs have steadily gained in technology and popularity for their safety, extreme battery efficiency, toughness, versatility and brilliant collimated beams.

Where did these bits of plastic and semiconductors come from and how did they become so important?

Flashlights and LEDs have different, yet parallel histories. The advent of white LEDs has revolutionized the way flashlights are built. "I think LEDs have definitely sparked the evolution of flashlights

as well as video sign boards and auto interior illumination," said Craig Johnson, founder of LEDmuseum.org.

What is an LED?

An LED or light emitting diode is a plastic light bulb that produces illumination and photons by the movement of electrons through an embedded semiconductor material. In the simplest terms, an LED is made with two different kinds of semiconductor material: one type that has too many free electrons roaming around inside, and another that doesn't have enough. When an electron from



one material (the donor) gets pushed across a thin barrier and fits into tiny spaces in the other (the holes), a photon or particle of light is produced.

Where did LEDs come from?

From the early 1900s to 1930s, researchers used zinc and phosphorous to create a low level light effect called electroluminescence, but it was too faint to be used. Several different experimental versions of the LED were created but it wasn't until the 1960s that the first modern LED emitting only an invisible red light became available. This was the basis for the first remote controls.

**It was only 10 years ago that
the best light LEDs were
capable of was in VCR,
calculator and watch displays.**

From the early 1960s starting with red, LEDs climbed the spectrum to pale green and yellow. The mid-1990s marked the birth of first super bright LEDs using Gallium nitride (GaN) and indium gallium nitride (InGaN) as the basis for emerald green, cyan (blue-green), blue, and later, violet and UV LEDs. This in turn led to the development of the white LED. The white LED is coated with

phosphorescent phosphor to absorb the blue end of the spectrum, which shifts the spectrum down to yellow/green, which mixes with residual blue to create a bluish white light.

"It was only 10 years ago that the best light LEDs were capable of was in VCR, calculator and watch displays so they've come a very long way in a very short time, technologically speaking," added Johnson.

Why LEDs?

- LEDs have up to 20 times the life of incandescent bulbs.
- LED systems are ideal for extended operation because of their low power requirements.
- LED use about one-tenth the power of incandescent bulbs, and are up to 90% more efficient than both fluorescent and neon lamps of similar strength.
- LEDs don't burn out like bulbs, and require less maintenance.

"The inherent advantages that LEDs have over common incandescent bulbs (long life, shock resistance, full color light) make them a natural choice as a replacement. Just a couple of years ago we saw LEDs appear on the market which could produce 10 times the light of the previous generation of LEDs," said Doug Pribis of Flashlightreviews.com.

LEDs offer big safety and maintenance benefits.

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In tests conducted at two U.S. Air Force bases, military firefighters used smoke machines to fill a room. LED flashlights made it possible for firefighters to read the words on a compressor at the opposite end of the room, whereas other flashlights could not penetrate the smoke particles clearly enough.

The normal working lifetime of an LED device, including the bulb, is ten years, lasting much longer than that of most other light sources. LEDs can fail by dimming over time, giving them a distinct advantage over the abrupt burn-out of incandescent bulbs. They also give off less heat than incandescent bulbs and are much less fragile than fluorescent lamps.

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Incandescent bulbs are cheap to buy but inefficient to run. They generate a range of about 16 lumens per watt for a domestic tungsten bulb to 22 lumens per watt for halogen bulbs. Fluorescent tubes are bulky, fragile and require starter circuits but can give large energy savings, weighing in at about 50 to 100 lumens per watt for domestic tubes. LEDs are tougher and much more efficient than the common incandescents, with the average commercial LED generating about 32 lumens per watt.

Unlike incandescents, LEDs don't need a filter to absorb most of the emitted white light. Today's white LEDs are made with a single blue LED chip that has been covered with a special material called a phosphor that glows a yellowish color when exposed to the blue light from the LED chip.

The overall result is a super bright LED that produces a white to bluish white light. Generally speaking, white LEDs are exactly the same as the blue LEDs. They have the same voltage and current requirements, because both white and blue use an almost identical chip.

The Flashlight Was Once A Primitive Torch

According to *Ever Ready's History of Flashlights*, the first flashlights were hand-made from crude paper and fiber tubes, with a bulb and a rough brass reflector. Because early batteries were weak and the bulbs were primitive, flashlights of the era produced only a brief flash of light earning them the name "flashlight."

In 1899, the first truly portable light was invented in the form of a clover-leaf bicycle light. As battery technology improved (slightly) the lights could be turned on for a few minutes (instead of moments) and they could be made in smaller sizes. The 1906 introduction of the tungsten wire filament replacing carbon filaments in light bulbs made them more efficient and brighter.

Flashlight technology took a leap forward in 1910 and paved the way for modern flashlights with the introduction of nickel-plated tubes to complement vulcanized fiber and the invention of

the tungsten filament bulb. Among the first portable light technology to become popular were the vest pocket tungsten flashlights, search lanterns, house lamps and intricate art deco candle lamps. The first tactical application came when they were given to the New York Police Department for field tests.

Fast forward to 2001 when the first LED flashlights were created using Luxeon LEDs in an aluminum casing. The generated light was too soft and diffused to make them useful for anything but closed quarters lighting.

"There were a lot of homemade LED lights in the 70s and 80s but the first commercially manufactured LED lights I reviewed were the CMG Infinity Task Light – Photon 2 Microlight in early 2000. They were useful for close range task lighting of six feet or less but incandescents at that point still blew them out of the water brightness-wise," said Johnson.

Recently, the LED technology has been refined at an incredible rate into high powered one to three watt lighting instruments broadcasting a brilliant collimated beam.

So What Does The Future Hold For LEDs?

Currently there is a sea-change happening with LEDs. Their beams can now be focused and brilliant with the help of engineered reflectors.

The latest in LED technologies offering bright light and consistent color in a very small package can generate as much as 45 lumens per watt in white for a 1 watt. Today's 1-watt LED is about equal to 10-20 + ultra-bright white 5mm LEDs, occupying the same or less space. Recent advances shine a single one-watt LED backward at a parabolic mirror to capture 100% of the generated light, is raising the bar for LED lights and ushering them into the professional marketplace as viable alternatives to incandescent bulbs.

**From a simple cardboard tube
and a dollop of plastic with
wires running through it, LED
flashlights have become and
will continue to be one of the
most important parts of plant
and safety operations today.**

Doug Pribis, author and owner of flashlight reviews.com sees an incredible future "I expect that LED lighting technology will continue to grow at an exponential rate. I would not be surprised if within the next several decades, most of the man-made light we encounter in our lives is produced by energy efficient, full spectrum solid-state LED "bulbs". It's only a matter of time until we see LED bulbs producing 10, 100, and 1000 Watts equivalent of light."

From a simple cardboard tube and a dollop of plastic with wires running through it, LED flashlights have become and will continue to be one of the most important parts of plant and safety operations today.

IFF

Greg Kang, the Engineering Manager at Pelican Products holds a Bachelors degree from California State University at Northridge and Masters Degree from the University of Southern California in Mechanical Engineering. Pelican Products is a leading manufacturer of technically advanced safety approved flashlights. Gradually the company has opened offices all over the world, starting Peli™ Products, S.A. in 1997 as the EMEA headquarters. Check them out at www.pelican.com and www.peli.com

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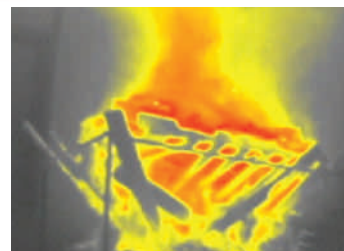
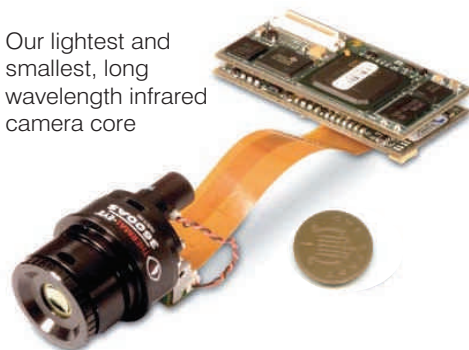
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The SOLOvision **S2** can be used as a hands-free unit or it can be hung over the neck like a pair of binoculars using the neck strap. It is the lightest and smallest thermal imaging camera in the World. It is suitable for use with all known breathing apparatus and gas masks. As an all round camera with the capability to monitor for fire / search and rescue of victims, there is no better camera for the job.



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The Thermal Imaging Camera:

A look at the past, present and future

By Paul Spooner

Product and Marketing
Manager,
E2V Technologies

Access to a wealth of information is only a touch of a button away regardless of whether you are sat at a desk or on the move and gone are the days of calling someone from a fixed telephone line, today we can choose from several different communication methods to instantly communicate with family, friends or colleagues anywhere around the globe.

This unstoppable progression in technology infiltrates all areas of life and the firefighting industry is no exception, we have all become part of the technology revolution, embracing change and looking out for the next product that will improve our lives and our jobs.

Over the last twenty-five years the thermal imaging camera has evolved continuously. Ever since e2v's (then EEV) introduction of the first hand held Thermal Imaging Camera (TIC) for fire fighters in 1981, there have been many changes. Although a revolutionary invention, the first cameras were also large, heavy, in-flexible and by today's standards, very basic. They used pyro-

electric vidicon tubes, which were fragile and offered poor performance, in modern day TICs all cameras use solid state Focal Plan Arrays (FPAs) making them strong enough to cope with the harsh environment and handling, synonymous with firefighting.

These advancements have happened thanks to the de-restriction of the technology from military use, to dual use, which allows the detectors to be used in commercial products. Although some restrictions still apply, the majority of Fire Brigades around the world are now able to purchase these pieces of life saving equipment.

With each new product the expectations of the end user has increased and the environments the cameras have to survive in have become even more varied. Where once a simple point and view camera was all that was needed, the end-user now wants, and needs, more advanced functions and features. Customer demand has meant that we have seen the cameras slowly get smaller and lighter, and as technology has advanced, new



features have been introduced to make the camera easier to use; LCD viewing screens, colourisation (today, all cameras have colour schemes to provide the user with the ability to detect the spread of the fire, first introduced on the Argus3 camera), image capture, remote video transmission, temperature measurement and digital zoom are common offerings in the modern camera.

Thermal cameras today mainly use Microbolometer technology detectors based upon Vanadium Oxide (VOX) or Amorphous Silicon (ASi) sensing materials. ASi has always been perceived as having the poorer performance compared to other technologies, but recent progress has

allowed improvement in the performance to nearly match that of the VOX detectors.

To meet these customer demands TIC manufacturers use state-of-the-art detectors and design the electronics and software to produce the highest levels of performance.

Essential features for current firefighter thermal imaging cameras include:

- **Durability**

The ability for the camera to be dropped without damage or loss of functionality. The cameras have to be light enough to held in one hand but rugged enough for the tough environment.

- **Environmental**

Must withstand low and high temperature exposure and be submerged to a depth of 1metre without water ingress. Temperatures at a fire scene can reach over 500 degrees centigrade and although the cameras will not reach these temperatures they must be able to be resistant.

- **Performance**

The camera has to reach highest levels of performance for battery life, picture quality and dynamic range. The camera's software has to be able to:

- Constantly monitor and control the internal temperatures
- Be able to react to external conditions to allow the best possible picture quality at all times.

The progress we have seen in the market to date has included:

- **Smaller pixels sizes**

This has created detectors that have smaller packages and higher resolution. For example: pixel size of less than 25microns from 55microns and resolutions from 160 x 120 pixels, up to 640 x 480 pixels.

- **Performance improvements**

The minimum discernable temperature difference of the original pevicon tube based cameras was approximately 0.3°C (300MK), whereas the performance of the new sensors sees this value reduce to 0.05°C (50MK).

- **Dynamic Range**

The dynamic range of a camera is the range of temperatures the cameras can see. With pevicon tube cameras this range was limited was 400°C, today that range can be in excess of 1000°C.

The trend in previous years was to use smaller format array detectors but in recent years larger formats are being used. This has come about by the reduction in pixel size, the ability to produce the detectors at the same prices as the smaller formats. The markets have opened up outside the fire market meaning the detectors are produced in larger quantities and the fire camera manufacturers are seeing the benefit through reduction of price based upon economy of scale.

Currently Helmet mounted cameras are being developed with good resolutions and applications, advances will continue in this area to make smaller, lighter products with continuous improvement on resolution and picture quality. The benefit of helmet mounted cameras is that the firefighters hands are completely free, they don't have to worry about holding the camera or the possibility of dropping it, also removing the need for a separate cameraman allows firefighters to find the victim or partner and exit quickly without using reference points, which could slow the rescue down, the disadvantages with current models are that they are found to be cumbersome and image can be lost through fogging of the firefighters mask, also the helmet tends to move around, requiring constant adjustment.

Future advancements in thermal imaging camera technology will be influenced by the reduction in price and size. As these factors come down, the personal camera could soon become a possibility. The personal camera could become small enough and cheap enough for every firefighter to have



one as part of their basic kit, removing the need for a separate cameraman. The challenge with the personal camera is designing something that can be stored on the firefighters uniform neatly and easily when not in use, so that it doesn't hinder a rescue where the firefighter will need both hands free.

Looking further into the future, the possibility of a 'Heads-up' display on the firefighters BA (breathing apparatus) mask is certainly a potential. In this instance the visual would be transmitted from a miniature camera to the mask, projecting a colour image right in front of the firefighters eyes. The advantages to this technology are; that it would be hands free enabling the firefighter to use the thermal camera at all times, even when exiting with a casualty, there would be no cumbersome apparatus to attached to the helmet which has the possibility of falling off, finally the problem of constant adjustment could be removed as the mask would be in a fixed position on the face.

Another serious consideration for thermal imaging camera manufacturers looking to bring new products to market are the Environmental considerations that must now be undertaken. In Europe the Reduction of Hazardous Substances directive (RoHS), outlines the restriction of the use of certain hazardous substances in electrical and electronic equipment. This Directive bans the placing on the EU market of new electrical and electronic equipment containing more than agreed levels of lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyl (PBB) and polybrominated diphenyl ether (PBDE) flame retardants. This means that all new Thermal Cameras have to be compliant with the RoHS directive. Although some manufactures are selling product under exemption, eventually all electronic and electrical equipment sold in Europe will have to be compliant. This directive, or forms of it are being introduced throughout the world. Japan and China have their version of the directive and in certain states in the USA this directive is being actively investigated. This directive was a major consideration for e2v when developing the Argus™4 and is the first compliant Thermal imaging camera.

Thermal imaging camera's have come a long way since they first came on the scene, they are smaller, lighter and the picture quality has improved ten fold. The camera of the future is yet to be decided, but one thing is certain, progress cannot be stopped.



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ISG Thermal Systems Ltd

ISG THERMAL SYSTEMS LTD is the world's leading manufacturer of thermal imaging cameras. Founded in 1991, the company operates from its Head Office at Basildon, England, and has subsidiary companies in Atlanta, United States, and Beijing, China. With sales to fire brigades in over 60 countries throughout the world. An example of this is that ISG supply thermal cameras to over half of the United Kingdom's 62 public fire brigades.



ISG's current models include the popular **Talisman Wasp** with x2 Zoom providing a clever magnified screen image. Other features of the **Talisman Wasp** include a Visual Overlay to provide more information about the surroundings inside a smoke filled building, accurate and fast temperature measurement and built-in video transmission. After extensive evaluation trials, the **Talisman Wasp** has been selected by the London Fire Brigade, which has now taken delivery of over 130 units for use by the UK's capital's fire fighters.

At the new Severn Park Training Centre (jointly used by Avon, Somerset and Gloucester fire brigades), **Talisman Wasps** are used in the live-fire training buildings to transmit thermal images to the remote training building control room. This installation uses an FM transmitter and is believed to be the first of its type in the United Kingdom. ISG collaborated in the design and application of this important safety feature at this new training centre.



ISG's new generation of miniature TIC is the ultra light-weight, super tough **Elite LITE**. Despite its small size, the **Elite LITE** has a powerful performance and specification, including built-in temperature measurement and video transmission. Weighing only 1.2kg (2.5lbs), the **Elite LITE** use latest generation of European microbolometer infrared detector and advanced signal processing. It is a fully automatic TIC, which switches on ready for operational use in

under five seconds. The **Elite LITE** uses either rechargeable NiMH or alkaline batteries and with 'easy load' battery packs can operate for up to seven hours of operational use.

The latest ISG miniature firefighting camera is the **Elite**. This has the latest powerful microbolometer performance giving a high brightness LCD colour display that all the firefighting team can readily see. With an infrared vision field of 54 degrees, the **Elite** is fully automatic in operation, has an unrivalled operating time and is proven firefighter tough. The **Elite** has a audible low battery alarm and a video transmitter.

These ISG thermal imaging cameras clearly illustrate ISG's technical design expertise and commitment to the future. ISG Thermal Systems can be justly proud of its contribution to the development of thermal cameras for firefighting and rescue work in many countries around the world.

The successful use of TIC's has undoubtedly made a significant contribution to safer and more effective international firefighting. Thermal cameras have indeed come a long way since their first use of the heavy and unwieldy



first generation units over 20 years ago, and who can foresee what further innovative developments are yet to come.

For more details contact:
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 Tel: +44 (0) 1268 527700
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 Email: sales@isgthermalsystems.co.uk
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Choosing the Best Thermal Image Cameras for Structural Collapse Rescue Operations



The Thermal Camera technology has proved to be one of the most effective tools available to professional fire-fighters today but successfully applying it to the collapse rescue operation needs more intense consideration of what key functions it must be able to provide to be of maximum usage to the collapse team. Equally important, it must be clearly understood by the operator on how best to apply those functions during initial recon-

naissance phases to the greatest effect. When one thinks about the many different Thermal Image Cameras that are now available to emergency response teams it is important that when purchasing one with collapse rescue functionality in mind, one should ensure that it possesses specific key functions that will be extra valuable in assisting the rescue efforts.

One excellent example that includes these vital functions is the latest SCOTT

A BUYERS' GUIDE TO THERMAL IMAGING CAMERAS

Health & Safety range of Thermal Image Cameras, i.e. the premier Eagle Imager® 160 and the compact Eagle X™. These lightweight Thermal Image Cameras are extremely durable and have been developed to meet the demands of the toughest rescue operations, ensuring total-reliability and providing valuable infra-red detection for a variety of Urban Search and Rescue (US&R), haz-mat security and law enforcement applications.

One vital function is the ability for collapse teams to be able to crawl into the pile and seek vision deep in to dark collapse formed voids. The Eagle Imager® has been ergonomically designed to make it versatile with a user-selectable handle position which allows the camera to be used while standing or crawling or even a hands free operation capability.

This is extremely important on 2 key collapse rescue team operational points:

1 The lens can be directed into locations without the operator having to place their head inside voids to see the screen and

2 Safety is increased by allowing rescue personnel manoeuvres over debris piles to have both hands free for maintaining their balance and stability.

Also this specific camera has an LCD-to-optics design which is specifically intended to help users maintain their orientation in dark and unfamiliar surroundings, and the large format viewing provides for optimal viewing by one or more. This also boasts a large 10cm LCD display with a replaceable lens cover which one can see on-screen temperature read-outs very clearly and a unique 3 position settings for the lens.

At the heart of the Eagle Imager® 160 is the most advanced 160 x 120 vanadium oxide Firecooled™ microbolometer with a dynamic range of 600°C and fast 60 Hz update rate to provide for smooth, seam-

less images. It also has an extra long 4-hour duration service life batteries, a simple one way-Twist-Change™ battery replacement and also a spare battery and vehicle mounted charging system.

The Thermal Image Camera is one significant weapon in the armoury of Urban Search and Rescue tools but it's crucially important that it's the safest and advanced when using within this dangerous environment.

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The Argus™4 – Thermal Imaging Just Got Hotter!

e2v



The Argus™4 thermal imaging camera from e2v is smaller and lighter, yet packed with even more features than the Argus™3. Argus™4 comes with x2 zoom, 13 colour settings and a picture capture facility capable of taking 100 pictures. However, at only 135mm tall and weighing only 1.5kg it is nearly half the weight of the Argus™3.

The Argus™4 enables 100 photographs to be stored then downloaded to a PC/Laptop through a USB cable for quicker transfer.

The camera utilises a Microbolometer sensor matched with electronics designed and manufactured by e2v, which ensures that quality and durability are built in.

Direct (spot) and ambient temperature measurement are also standard features on the Argus™4, allowing for accurate assessment of site temperatures and identification of specific danger points.

The Argus™4 is sealed to IP67 and has also been designed to survive at least a 2m drop test as well as tolerate high temperatures.

e2v has recently launched two new accessories for the Argus™4 camera; The combined Truck Storage Mount & Battery Charger and the Transmitter & Battery Pack.

The Truck Storage Mount & Battery Charger provides secure storage with instant access for the Argus™4 Thermal Imaging Camera and charging facilities for the

battery pack. The unit is designed primarily for the storage of a camera within a fire truck, but can be fitted to any flat surface.

The new Transmitter & Battery Pack accessory for the Argus™4 Thermal Imaging Camera transmits thermal images from the camera, to personnel outside the fire incident via a 2.4GHz Wi-Fi digital transmission for remote viewing.

The Argus™4 Transmitter and Battery Pack is conveniently and easily fitted to the Argus™4 camera in place of the normal battery pack, allowing the system to be transferred between cameras. The unit is sealed and will survive the same harsh environments the camera can withstand.

To view the transmitted thermal image a Remote Receiver Station or Receiver Kit is required and these accessories are available separately.

For further information about the Argus™4 camera or to arrange a free demonstration, visit www.argusdirect.com or call +44 1245 453443.



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ISG

Thermal Systems Ltd.

Technologically advanced designs from GB SOLO

GB SOLO offer the most ergonomically efficient protective helmets and the most versatile and rugged long-range thermal imaging cameras available today. GB SOLO's technologically advanced designs, with CE Category III PPE approved safety features, bring them to the forefront as the ultimate range when it comes to firefighting, search and rescue and surveillance operations. Our devices save lives! From the total head protection offered by the SOLOunifit through to the 1km detection range of the thermal imaging cameras, GB SOLO technology has helped both victims and rescuers.

Well now, our cutting-edge technology brings you a revolution in fire fighting thermal imaging cameras. Introducing the brand new SOLOvision S2 FIRE. Half the size of the original SoloVision and the smallest and lightest fire-fighting TIC in the world.

For fire monitoring operations the SOLOvision S2 will easily identify the beginnings of even a small fire and given the temperatures of the fire base, the S2 will pick up the heat through steel and other metal work. Any glare from a fire can be quickly identified and the fire suppressed. The S2 will identify exactly the seat of the fire and this camera has been designed specifically for close in fire suppression work.

The S2 has picture download capability along with on screen options for colour, spot temperature and battery awareness monitor.

The SOLOvision S2 can be used like a pair of binoculars hung over the neck using the neck strap and is the lightest TIC in the World. However, if the situation calls, the unit can be used as a HANDS FREE camera. One of the many benefits of the SOLOvision S2 is that it allows Fire and Search & Rescue teams to move efficiently no matter what conditions are faced. THE S2 is water resistant, vibration proof and can withstand a flashover of 1000°C for 10 seconds. It is suitable for use with all known breathing apparatus and gas masks. As an all round camera with the capability to monitor for fire/search and rescue of victims, there is no better camera for the job. Tested to IP67/68, EMC conformity each S2 leaving GBSOLO is subjected to such test environments and each unit is signed off within an individual service/ownership manual.

The SOLOvision S2 SEARCH & RESCUE is ideal for any search and rescue situation from surveillance and vessel security to 'man overboard'. It can identify objects over long ranges through darkness, fog, smoke, or direct bright blinding spotlights but can still be used for close in operations.

Being a long-range thermal imager, capable of identifying individuals over 1000 metres away through smoke, fog, darkness or camouflage, the S2 is also the ideal camera for Security/ Surveillance operations, Border Patrol, Law Enforcement, Long-Range Man Detection, Night Vision, the list of possibilities goes on and on.

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will benefit from the worldwide supply, technical & sales support, service and repair facilities from the custom built manufacturing facility of GB SOLO Ltd in Scunthorpe, England. Minor running repairs can be undertaken by a local agent, saving downtime.

Everyone from Firefighters, Crash Teams and Marine Rescuers moving quickly to accident sites through to Security Personnel identifying intruders on even the darkest of nights have benefited from GB SOLO products.

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Introducing the new Evolution 5200 Series of Thermal Imaging Cameras

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High Performance Safety

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 - Twice the Low Sensitivity in the 320° to +1000°F range, compared to all other Fire Service TICs – for great imaging!
- It all adds up to the highest ISDR* of any Fire Service TIC – with clearer, sharper, more detailed images over the entire temp range.

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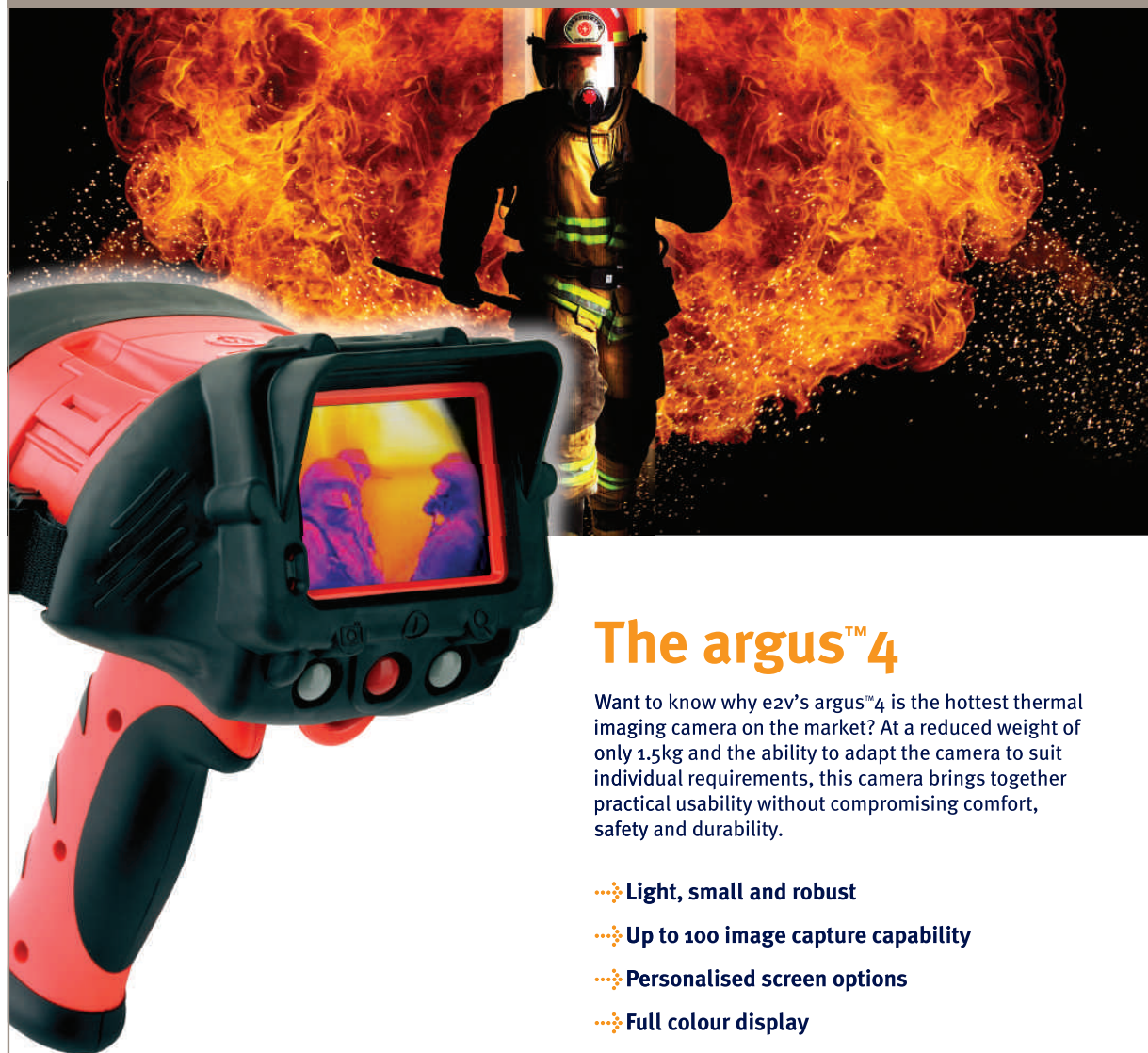
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Comparison of Fire Service TIC Performance

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lack Heat Seeking color in High Sense mode, an important tool to determine the presence and direction of the fire.

- Limited Temp Range in High Sense
- Temp Range is below 300°F
- Some models have limited High Sense
- No Heat Seeking Color in High Sense
- Limited Sensitivity in Low Sense

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improved visibility of areas of concern. The advanced relative heat indicator assists users with image interpretation, and startup time is less than four seconds.

Founded in 1898, Bullard is a leading manufacturer of personal protective equipment and systems worldwide. Product lines include thermal imagers, hard hats, firefighter and rescue helmets, supplied air

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Transitional Fire Ltd

Graham Leney, director of Transitional Fire started out as an engineer/sales consultant for Caterpillar UK. Fed up with feeling like a small cog in such a large corporation he decided to start his own company Graham Leney Ltd a fabrication and generator/container hire & sales company.

Over 5 years ago, purely by chance, Graham was asked to carry out some repair work for Devon Fire & Rescue service whose training ground was less than 5 miles from Grahams Ottery St Mary workshops. Devon Fire and Rescue are one of the UK leaders in Fire Behaviour Training. They have an established training partnership with the Swedish Rescue Services Agency, the Swedes are the country who first brought this concept of fire fighting to the UK. Graham, being an engineer, took great interest in what was trying to be achieved with Devon's Fire Behaviour training units. It was not uncommon for Graham to get a call from Devon's dedicated Fire Behaviour Instructors saying 'Graham, we've had an idea, can you build us this!'. The same went for Graham, 'working for so many Fire Services I get exposed to a wealth of knowledge and ideas, and being an engineer I can bring these ideas to life, some work, some do not, that's what makes our job so interesting. Our products are constantly evolving. Now with over 15 Fire Services on the books Graham decided to dedicate one arm of his business to working purely for the Fire Service. This is called Transitional Fire with a web site www.transitionalfire.com.

The use of converted steel shipping containers to deliver Fire Behaviour Training has been used in Europe for over 20 years to demonstrate fire growth, flashover and back draught phenomena. This is normally achieved by single converted containers with some H block configurations. Indeed, the deaths of fire-fighters in backdraught/flashover incidents over the last decade have meant all fire and rescue services have developed strategies to ensure their crews are better equipped to deal and understand compartment fires. Fire Behaviour Training is now carried out by Fire Services worldwide and has been proved to save lives.

Fire Behaviour Training is just a small part of what today's modern Fire Service is expected to train for. With this in mind when approached to design a training unit which replicated a multitude of training scenarios the first multi trainer was born. It was designed by operational Fire fighters in conjunction with Transitional Fire's engineers. The result is a clever combination of 12 containers interconnected to create a multi compartment, multi level training facility.

From the outside the facility looks exactly what it is, a series of container units bolted together to form a three level structure; indeed the units are delivered by crane lorry and constructed on site by Transitional Fire, significantly reducing costs. Inside, however, the fact that the units are designed from scratch, incorporating all the expertise from fire fighters, becomes abundantly clear – the units are the definition of bespoke. The design had one aim in mind, to safely replicate as many useful and realistic fire scenarios as possible. It really does feel as though you're inside solid building."

The usual demonstration and attack Fire Behaviour containers are present, the only difference being on the multi trainer they are interconnected, with doors and windows, landings leading to staircases, external ladder entry points and even a crawl cage. Crews can practice scenarios which include fighting fires using left and right door entry, inward and outward opening door entry. Dry risers



on the second and third floors allow crews to practice high rise procedures to replicate fighting fires in tower blocks. Entry can be made from the roof to replicate basement fires. Crews can practice tactical Positive Pressure Ventilation in offensive and defensive modes with crib fires on each level. Basically this is a mechanical means of forcing air into a building, normally by a large fan, and removing hot gases and smoke. Forcing air into a fire situation does have its problems and the Multi Trainer allows fire fighters to train for this in safe but realistic conditions.

The heat experienced from the fire is also realistic, a sensation not experienced with gas fuelled units, better preparing the fire-fighters for the potential heat stress experienced in a real fire although gas is an option. Where smoke alone is needed, smokers, similar in appearance to simple garden incinerators, are filled with kindling, topped with wet straw or hay and set alight. An option of a lift shaft configuration is available to replicate lift rescues with access points at each level. Another option was working at height, rope pack scenario's along with ladder access points.

Some Fire Services require a specific training scenario ie a ship layout configuration, industrial plant rooms even a submarine site has made enquiries. Basically any design feature can be incorporated into the Multi Trainer.

The Multi Trainer is totally reliable and being converted steel container is very cost effective. There are minimal maintenance costs associated with the units and the most used containers can be unbolted and replaced as necessary reducing costs and downtime significantly.

Today's modern Fire & Rescue Service really does have to be multi tasked this Multi Trainer provides an affordable answer to meet these training needs.

We deal with a whole range of Fire Services all with their own budget requirements. Again by listening to our customers we now have teamed up with a major finance company and are able to offer lease or rental packages over 5 or 7 years. A maintenance package is also available if required. Model documentation of risk assessments, operating procedures, lesson plans can also be provided.

Transitional Fire want to make the whole experience for our customers to be a pleasurable one. We want to involve them every step of the way retaining the personnel touch. We understand our market area is like a small community and reputation is everything.

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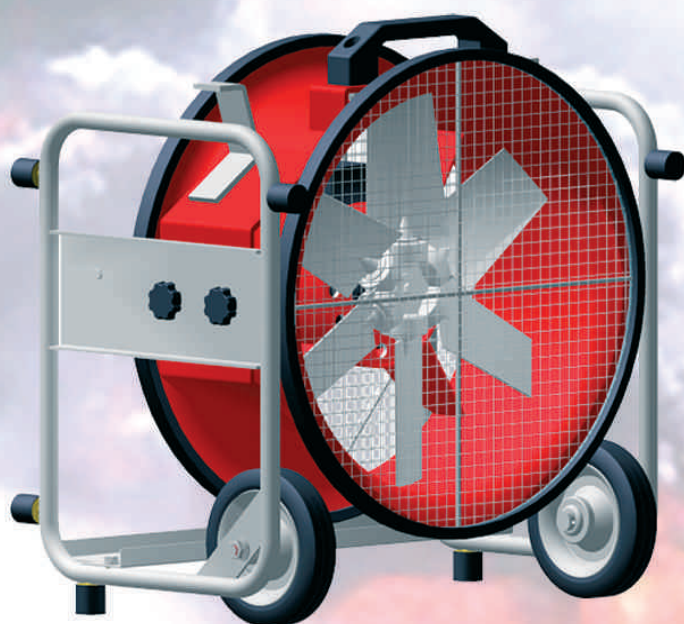
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Placing Fans for Optimum PPV Effectiveness

By Roger
Weinmeister

Super Vacuum
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PPV Basics – One of the most powerful tools in any fire departments arsenal is their ventilation equipment. Ventilation is essential not only for reducing property damage after the fire is extinguished, but even more importantly for improving life safety for both the firefighters and any victims of the blaze.

It is this key element, Life Safety, which has driven many departments to address the manner in which they ventilate on the fire ground. Using a fan to blow into a structure defies most sound firefighting theory. But it was found that the air did not have a significant effect on fire behavior. Similar to a typhoon, oxygenated air is drawn in low and heated combustion products are expelled upward. The fan, if set right next to the seat of the fire would greatly increase combustion. But when the fans energy is spread out over the entire room, it only has enough power to create a steering force on the combustion products, much the same as a weather front might steer a typhoon (Figure 1). Departments new to PPV should, at first, only use it after the fire has been extinguished. This will help them to gain knowledge that can then be taught during training. To effectively use PPV as a fire department requires that a majority of the firefighters understand the concept and have been

allowed to train with it prior to utilizing it in an actual fire. Always remember these basics when ventilating on the fire ground:

- 1 Never Use PPV in a Backdraft Situation (fire starved for Oxygen)



Figure 1



Figure 2

- 2 Never Use PPV if there are people (victims or firefighters) between the seat of the fire and the exit opening.
- 3 Open the exit opening prior to using the PPV fan to pressurize the structure
- 4 Coordinate the ventilation with other fire ground activities
- 5 Always open and check for fire extension after main knockdown

Positioning PPV Fans – Early in the adoption of PPV technology, there was great emphasis on sealing the door. The entire cone of air was supposed to cover the entry location. This generally caused the fan to be set > 3 meters from the entry door. With much work and testing, it has been found that PPV can be very effective with closer placements and the “seal” being formed inside the structure. This allows PPV to be used in situations where there is a smaller area near the entry (Figure 2). It is common to set units as close as 1 meter and provide very effective air movement. These close sets may be required on dwellings that have a small porch or a narrow hall way at the entry.

Placement of multiple PPV fans is now much better understood also. The use of a “V” attack (Figure 3) increases the flow of air into the building to more quickly ventilate any contamination. It also allows the hose lines and firefighters to move straight into the building. This parallel set is much more effective in ventilation of structures than older series set with two fans in series (Figure 4). Just as using two pumps in parallel moves more water onto the fire, two fans in parallel moves more air into the structure.

Care should be taken on tilting fans with petrol engines. Engine manufacturers design with a maximum tilt angle of 20 degrees. This is due to the design of the oil pan and lubrication system. Most PPV fan manufacturers respect that limit and may add a degree or two of safety factor, since the unit may be set on a surface with a slight slope for drainage. Do not allow firefighters to crib the fan

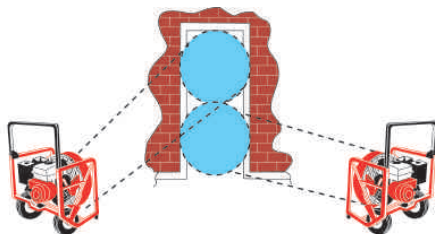


Figure 3

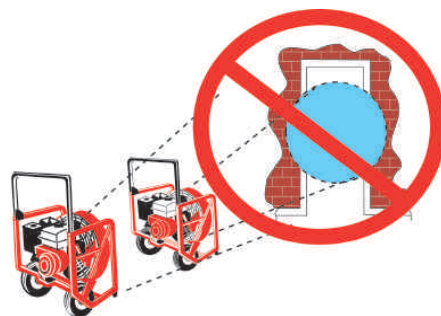


Figure 4

to greater angles by placing wooden blocks or other materials to steepen the fan angle when using petrol driven fans. Electric PPV fans can be cribbed to greater angles with no problem except the stability of the unit.

Weather – Wind plays a big role in how effective your department can be when utilizing PPV technology. In general, PPV will not be very effective in wind speeds over 20 kph. In higher wind speeds, it is best to use the wind to your advantage. No wildland firefighting is done from the downwind side and this is also true for structure firefighting in high wind. As wind speed increases, it is best to make smaller exit openings or to move air at angles to the wind direction. It is physically impossible to overcome high natural wind speeds with a small portable fan.

Extreme cold does not negatively impact the effectiveness of PPV, but it can create freezing problems in the structure. This is not a problem in large fire, but could be on more routine ventilation situations. If someone has a small kitchen fire on the stove, do not over-ventilate causing the water pipes to freeze.

Special Situations – The situations below require a better knowledge of PPV use and how to position fans for maximum effectiveness. If your department does not currently use PPV for ventilation, it would be best to not attempt the situations below. All of the following situations are greatly enhanced if you use existing ventilation systems whenever possible.

High Rise Ventilation – One of the most powerful applications of PPV is its use to maintain the conditions of stairwells. Stairwells are the main arteries of high rise buildings. They are the means of egress for the occupants and the means of ingress for the firefighters. Many buildings have pressurized stairwells built into them. The use of PPV can assist in this pressurization or perform the task for systems that are not functioning due to fire conditions. To properly perform ventilation in a high-rise full of people, many firefighters are needed to police the ventilation corridors and prevent occupants from inhibiting ventilation by



Figure 5

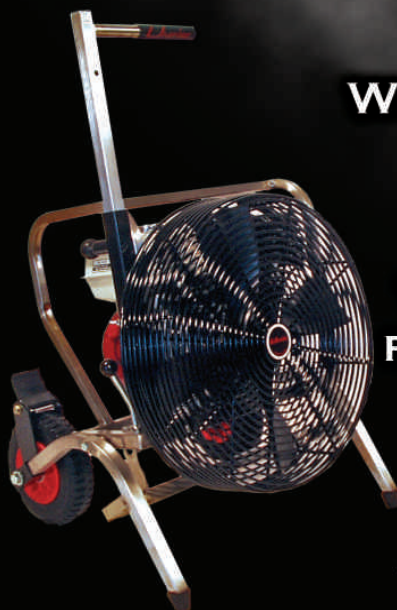
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Figure 6

other opening doors and windows. As with all firefighting situations, high-rise ventilation should be constantly monitored for effectiveness. If it is not working, evaluate the overall situation and correct the problems.

Basements – Basements and other below grade situations can pose challenges to effective PPV fan placement. Generally, the problem is finding an appropriate outlet or enough outlet area. A common mistake is trying to place the fan so it is blowing directly down the stairway. It is perfectly acceptable to place the fan blowing into the front doorway, making sure the door to the stairway is held open, and there are adequate openings in the basement windows. This situation requires good coordination so other firefighters do

not open other windows or doors. If this happens, the air will take the easiest route out of the structure, severely decreasing the effectiveness of the basement ventilation. If there are no other openings in the basement, either cut an opening in the floor to provide one, or use flexible ducting to provide one (Figure 5).

Large Commercial Buildings – Generally, large commercial buildings can be ventilated exactly the same way as smaller homes. The problem usually is the size of the PPV fan compared to the expanse of the building. The easiest solution is a very large fan (Figure 6). However, it is still possible to ventilate large buildings with multiple small fans. Garage doors can be propped open-way, with 2-4 fans blowing into the opening created (Figure 7). This can be done at more than one position for an even greater effect. Another problem with large commercial buildings is with the high ceilings. The best solution is to create openings in the ceiling (smoke vents, roof access doors, or other normal openings are best). If there are no openings in the ceiling, prepare for a long wait until the structure is fully cleared.

Implementing PPV – The use of PPV for fire ground ventilation can be phased in over time. It is important that a department practice with PPV after the fire before using during a fire. As confidence is gained, the instructors can start teaching PPV to various groups within the department. If they only teach the incoming rookies, those rookies will get on a fire scene and be overruled by the veterans. So instruct an entire group on PPV technology. Let them play with various scenarios. Time the ventilation of fake smoke with the veterans' method, then with PPV. The goal of a progressive department is to save as many lives as possible in the most difficult situation. By effectively using PPV in an aggressive manner, lives can be saved. Firefighters can avoid calling in the RIT team because they can see the buildings layout as they go in. PPV can also help in property conservation by allowing firefighters to quickly find the seat of a smoldering fire. Structural firefighting will always be one of the most dangerous situations faced during your career, so use all of the tools available to make it easier. **IFF**

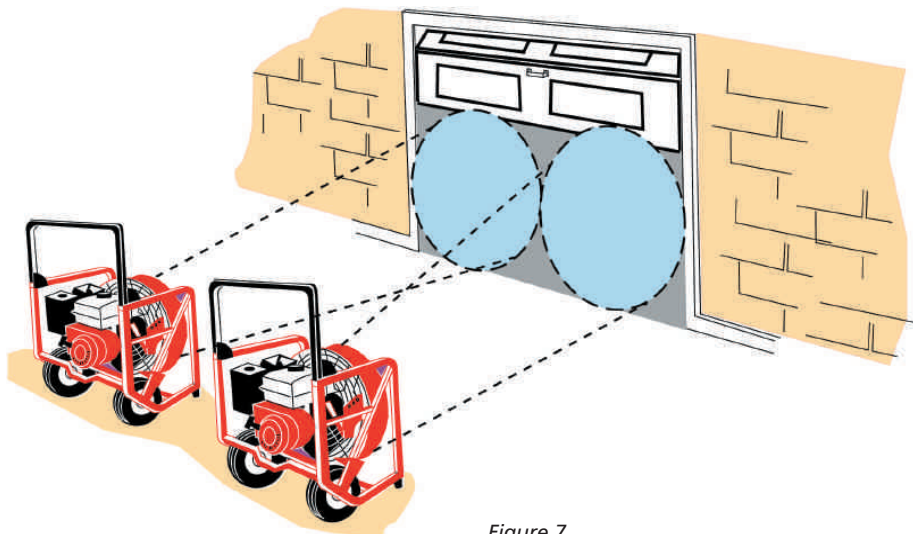


Figure 7

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Pic courtesy of Reuters

All round head protection in any fire fighting - All-round head protection in rescue service interventions - Industrial protection whenever temperatures are significantly increased (250°C, 30 min)

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Fire Helmets – the way forward

By **Bob Gaskell**

Fire fighting helmets have come a long way since the days when they were made from a combination of cork, vulcanised rubber and cotton twill bonded with resins.

In the 1930's the first cork helmets were introduced to replace the impressive looking, but increasingly impracticable helmets manufactured from brass. The use of layers of cork sheet cut and glued together, was the same manufacturing process as that used for many years when making the tropical 'topee' helmet.

The use of cork gave the benefits of good shock and thermal protection combined with lighter weight and reasonable comfort to the wearer. This then established the distinctive style of helmet with a brim and comb that became the standard for use in many countries worldwide. However, the drive towards more rigorous standards of protection, with the need to improve wearer comfort and reduce through life costs, accelerated the development of fire and rescue helmets to meet these requirements.

Fortunately the availability of modern materials such as thermoplastics, composites and resin impregnated glass fibre, combined with new moulding techniques have enabled the introduction of helmets that are both lightweight, and extremely strong.

Having to be worn in arduous and hazardous conditions, there are two main criteria that establish the suitability of the modern fire helmet – the level of protection provided to the wearer and comfort and fit,

To provide protection for the face and head against a wide range of hazards such as, impact penetration and shock, fire, radiant heat, chemi-

cals, and electrocution, and to do so in varying climatic and operational conditions, places great demands on the helmet, and consequently on the design and construction process leading up to approval testing, certification, and introduction into service.

Apart from the physical protection provided by the helmet, the extent to which the helmet can be adjusted for both fit and comfort, ensures that an effective interface with a breathing apparatus facemask and protective clothing can be achieved. The helmet therefore will usually achieve this by means of an adjustable headband, forward and backward location, height adjustment capability, and a multi position brow guard angle.

In addition the construction of modern fire helmets provide the added benefits of easily replaced individual components, thereby reducing maintenance, improving hygiene and increasing service life with an associated reduction in lifetime ownership costs.

The current British/European Standard BS EN 443:1997, is an internationally accepted approval standard for fire helmets, and in common with other international standards such as AS 4067 (Australia) and includes an extensive series of tests covering, field of vision, shock absorption, resistance to sharp objects, flame resistance, radiant heat resistance, electrical properties, and retention system strength, with additional optional wet helmet and surface insulation tests.

Prior to testing the helmet is subjected to pre-

Dual Shell Fire Helmet

conditioning which will include procedures such as UV ageing, solvent conditioning, and thermal plus or minus conditioning, depending upon the specific test to be carried out. A separate standard and testing procedure applies to the helmet faceshield, the current standard being British/European Standard BS EN166: 2001, which has superseded BS EN166:1995

By nature of the varied and extreme operational conditions experienced, the fire and emergency services have particularly demanding communications requirements. Confined spaces, high temperatures, high levels of ambient noise, all combined with the stress and rigour of the work being undertaken, make good radio communications a vital necessity.

Most fire helmets can now be supplied with integral communication systems, or be capable of accepting a removable headset with microphone and receiver that can be connected to the radio via a download and push to talk unit

A major factor in the design of the latest fire helmets has been the requirement to reference

published international anthropometrical data relating to both male and female fire fighters and rescue personnel, across a range of ethnic groups, thereby ensuring that the helmet will be suitable for international use. Consequently the latest development in fire helmets has been the introduction of dual shell types that reflect this requirement

Dual shell helmets enable the Fire and Rescue Services to use the double shell helmet when undertaking structural fire fighting operations, and use only the inner shell when attending other emergencies such as road traffic accidents, woodland fire fighting, water rescue, urban search and rescue and industrial incidents such as confined space rescue operations.

For the future the fact that several international manufacturers of fire helmets are also manufacturing helmets for military and civil aircrew means that some of the technology and operational features can cross over into the development of fire helmets.

The latest aircrew helmets such as those being developed for the Eurofighter Typhoon and Lockheed Martin F35 Joint Strike Fighter, introduce helmet mounted flight information displays, high 'g' load sealing masks with advanced communication systems, and materials which enable the helmet to be lighter and have the optimum in fit and comfort levels. Many of the requirements of an aircrew helmet mirror those of the fire helmet – impact and penetration resistance, fire and radiant heat protection, coupled with minimal physiological effect on the wearer.

It is very probable that special fire and rescue operations teams will need to use such helmets in the future. There are already major advances in the use of telemetry associated with the use of breathing apparatus and fire entry control systems; the limiting factor has always been the extra weight that ancillary equipment adds to the base equipment. The fire helmet can be an ideal platform for the addition of sensing, warning and monitoring equipment that integrate with the other protective equipment worn by the emergency services personnel.

Firefighter Footwear

Footwear specific to fire fighting has to perform various functions in what is the harshest most dangerous work environment anybody would ever face. There are important aspects to consider which combine safety & comfort of the wearer.

By Paul Bowkett

Changes

The advances in safety footwear have been vast since the days of heavy solid soles. The trend for lighter materials and comfort factors in leisure footwear generally means that this is demanded across all aspects of workplace footwear, whether it be for patrolling, construction or firefighting. Manufacturers have to find ways to develop footwear which improves the levels of safety and include those important comfort factors.

In addition to those product expectations the role of the fire fighter is changing due to the broader variety of callouts. Wellington boots may be ok in fire or water related incidents but for Road Traffic Accidents and other rescue situations

they could be totally inappropriate. Firefighters need to be fully mobile and effective in all situations they face, and would indicate the need for a multi-task solution.

Important Features

Footwear must comply with the latest safety standards, which ensure the footwear will resist a minimum level of impact and compression force. It should also allow for wearer comfort in a long enduring shift using quality materials and innovative technology to this end.

Upper Materials

Upper materials should be considered for its resistance to hazardous environments and natural

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elements, but also the level of breathability it will provide. The best full grain thick leather ensures some protection from flames and water and allows the foot to breathe, rubber is fully waterproof but is often hot, sweaty and uncomfortable to wear.

The Sole

The sole is probably the most crucial element of firefighting footwear as this will have the longest contact with the ground. Procurement managers should look for a tough rubber outsole for superior durability, to resist nicks and cuts into the sole and for its higher heat resistance. The sole is also responsible for comfort of the feet and other parts of the body. Solid rubber soles do not allow for shock absorption which can effect long term condition of knees, hips, the neck and back. Plus they are often heavy and tiring on the wearer's feet. Dual density sole combinations are commonly used which incorporate two specific layers of material, a harder dense outsole with a lower density midsole to provide a lightweight and comfortable wear.

Donning and Doffing

There is clearly an emphasis on speed in both donning in rapid callout situation and getting the footwear off easily after long hot shifts or in an emergency. There have been stories of firefighters having to be cut out of their boots after an extremely long and difficult shift, which makes this problem very real. Some premier manufacturers have considered this problem and created an elasticated, flexible ankle area in a traditional leather wellington style. This offers security whilst in action, but also makes them easy to remove. Other ideas include a lace up/zip up combination so the footwear can be tightly secured to the preferred level but also quickly zipped on and off.

Fit

Although obvious, a good fitting boot improves the performance of a firefighter, giving them confidence in their uniform to go out and focus entirely on the job in hand. Again it is arguable that traditional rubber Wellingtons can provide an adequate fit versus other branded footwear. A good secure fit can be achieved by a fitting consultation

to ascertain the correct size, and looking at zip up, lace up or elasticated grip alternatives.

Technologies

With all the essential safety features covered, fire brigades must then consider the fit and comfort factors that differ between manufacturers. The most crucial aspect is the sole where technologies may differ. Whilst there are many soling technologies, only a handful would suffice for a firefighting role. The best 'fit for purpose' firefighter sole on the market would be the dual density rubber (DDR) sole, as it is a highly durable thick rubber sole made of two specific layers, a tough high density outsole and a lower density midlayer which provides the shock absorption and comfort. In practical terms other soles with a combination of polyurethane and rubber cannot offer the same level of protection and durability.

All firefighting footwear should also include waterproof properties which can be provided by use of waterproof membranes or rubber. Premium firefighting footwear includes systems like GORE-TEX® to provide a breathable yet waterproof solution. Generally these systems offer the best level of comfort in terms of warmth and dryness, and can prevent foot or nail diseases.

Fitting consultations are always recommended to ensure all firefighters obtain the best fitting and most comfortable boot to the correct safety standard.

Conclusion

Footwear should allow the wearer to be in complete control, so the right fit and great flexibility in a pair of boots make for important considerations. Procurement officers must not overlook comfort factors for firefighter footwear, where a lighter weight and shock absorbing rubber sole can make all the difference to the performance and long term health of the team. The right footwear offers a firefighter the optimum protection against the extreme external hazards but factors in those important comfort and flexibility features to ensure the firefighter can last the distance. It is what we have tried to do with our own Goliath firefighter range, taking in all those considerations and developing a comfortable, lightweight dual density rubber sole solution.

For further information about the Goliath Footwear range please visit www.goliath.co.uk.



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Modern-day armour

By **Caroline Southcombe**

Southcombe Brothers Ltd

A firefighters' hands are one of the most vulnerable parts of his body. Hands are used to clear debris, burning or contaminated with chemicals, blood or other pathogens. Firefighters use them to lift the injured from wreckage or fire.



Gloves that protect the user and yet still manage to be dexterous are the holy grail of fire gloves, and gloves are the most discussed items of PPE. Debates rage as to which type of glove is preferable and indeed which materials are the 'best'. The one truth that comes from all this debating is that there is not one 'magic' glove that will do it all, and gloves for fighting structural fires need different qualities from those used for extrication purposes.

We know that fire-fighters face many different hazards as part of their daily work. Solvents, chemicals and sharp objects are just as threatening as the risk of scalds and burns and firefighters are equally as likely to encounter them. Therefore all fire gloves have to provide protection against a wide variety of hazards. Of course, they must also allow the firefighter sufficient dexterity to operate all the complex machinery used in today's technologically developed fire service.

Historically, most fire brigades in the UK had purchased gloves to the American National Fire Protection Association (NFPA) specification. The ideology behind the development of American gloves was that the thicker and harder they are, the more protection they could offer. The new European standard (EN 659), introduced in 1996, challenged this. That standard has now been refined and a further standard added – EN659:2003. This includes a number of alterations and additional tests to take into account:

There are three levels of protection applicable to an EN standard.

- 1** simple design
- 2** intermediate design
- 3** complex design

Fire-fighting gloves incorporate the highest level (3), complex design. All of the materials used in the glove, plus the actual design and structure are tested by an independent laboratory before being awarded the EN standard. The manufacturing of

complex design products must also be certified to an approved Quality Management system.

Current thinking means that minimum performance standards have now been increased for abrasion, tear and performance standards. This ensures that gloves that meet the standard are now more robust and durable, offering greater levels of mechanical protection.

A revised version of this standard has now been accepted: EN659:2003. This includes a number of alterations and additional tests, taking into account areas that were not previously covered by the 1996 document. For example, the method given for radiant heat has been changed. The new methods given in ISO 6942 (superceding EN366) utilised a heat flux density of 40k/m².

A requirement for the contact heat of a wet glove has also been included. This test takes into account the potential risk of steam burns or scalds where moisture build-up on the inside of the glove is driven to steam through external contact of the glove with hot objects.

One new and significant area which was not covered by the original version of EN659 is the potential of contact with liquid chemicals. Firefighters often find themselves in situations where accidental contact with a liquid chemical occurs. As firefighters know always too well, it is not always possible to avoid contact with these hazardous chemicals. It is essential that gloves are constructed in such a way that they provide a protective barrier against liquid chemicals. The EN368 test method is used to assess the glove against a range of chemicals: 30% sulphuric acid, 40% sodium hydroxide, 36% hydrochloric acid and heptane have been chosen to represent the most common types of chemicals that are encountered.

Taking all of the situations and hazards that today's firefighter will encounter, it is essential that hands are given the maximum amount of protection. But it is not quite as simple as layer upon layer of thick, protective fabrics. A poorly designed glove made with inferior materials can prove to be so frustrating to wear that the fire-fighter is





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encouraged to remove the glove in a situation that requires dexterity. For obvious and chilling reasons, this can be extremely dangerous. The design of a glove is of paramount importance to ensure the best possible combination of protection and dexterity.

To ensure the highest protection, it is recommended that the outer shell of the glove is made from a good quality grain leather. The first line of defence in the fire-fighting glove is the outer shell, so the need for an excellent quality protective leather is the most important requirement.

LEATHER TYPES

Pig Leather – smooth and firm, recognised by hair holes in the skin – used for cheaper leather gloves

Goat Leather – strong leather more suitable for basic working gloves

Cowhide Leather – very tough, very strong and supple. Ideal for gloves where protection and dexterity are required.

The term 'hide' describes the outer covering of large animals, i.e. cattle, while 'skin' refers to small animals e.g. sheep, goats and pigs. The characteristics of animal skins vary accordingly to the part of the world the animal lives. Generally, the temperate zones of the world provide the best environment for growth and development of livestock. The less favourable the climate and the more primitive the animal husbandry, the poorer the general condition of the animals and the lower the potential leather-making qualities of their hides and skins. The leather industry in the UK follows a strict chain of events to produce a high-quality product. Once the animal has been slaughtered, the raw hides must be preserved to stop deterioration, especially during transportation. The hides are 'fleshed' to remove the fleshy tissue on the inside. Depending on the thickness of the hide, it is then split into 2, 3 or 4 individual skins. The first and best quality leather will be the top grain side, the second or third split in the hide will result in an absorbent suede leather, with no tensile strength, mainly used for cheaper styles of fire gloves.

The next stage is adding solvents to the dye vats – these reduce the grease level to 5%, which is acceptable for dyeing. Tanning converts the raw skin into a stable material which will not putrefy, this is done with minerals such as chromium,

aluminium and zirconium. Shaving the leather is done to achieve a uniform thickness for fine glove leather; this is usually 1.1mm to give adequate protection from the leather and also the highest dexterity when on the hand. The final wet process is for the hide to be dyed, this can either be surface dyed (the cheaper process) or complete penetration dyeing. Fat liquors and chemicals are also applied in this process to give flexibility and softness.

There are two basic designs for a firefighters' glove, they can use either a Gunn-cut design or a fully fitted design.

The Gunn cut design is a cheaper option, as it has only one leather centre piece to fit the sides of the two middle fingers, thus having less seams. However, the fully fitted cut design incorporates a separate piece of leather cut for each side of the fingers, thus using more leather and more stitched seams, but offering a better fit, with more dexterity. The actual cutting of the leather into the hand shapes is of vital importance. The skilled cutter must first ensure that the hide is free from faults and scars, plus they must ensure, through stretching, that the leather has 'run', meaning that the leather is not restrictive when the hand closes into a fist shape. However, for the *length* of the glove, the stretch in the leather *must* be restrictive, you do not want the finger lengths to grow longer and longer the more times they are pulled on and off the hand.

The separate leather pieces (in some cases up to 9), are now ready to be sewn together to form the outer shell.

In a modern, protective, three-layer glove, the combination of the moisture barrier and the inner lining is very important. This barrier and lining supports the protection given by the leather shell and must be securely stitched into the tops of the fingers to ensure 100% lining retention.

The range of materials available to glove makers has undergone a revolution in the last decade. While the more traditional materials, such as cotton or nylon and pile fabrics still have a role to play, the age of the performance fabric is now with us.

Fabrics or yarns are now available which thermoregulate, transport and manage moisture, stretch for comfort without losing shape, prevent the passage of blood-borne pathogens and even inhibit the growth of bacteria. Ideally for fire-fighting gloves you need a material constructed from aramid fibres, such as Nomex, to offer protection for the hand against thermal and mechanical hazards.

Although the EN659:2003 standard still does not have a requirement for a waterproof membrane, a good quality firefighting glove will incorporate a membrane – particularly one that is resistant to blood-borne pathogen fluids.

Gore's state-of-the-art Crosstech moisture barrier has been qualified under the NFPA standard 771 (1997 edition). Gloves incorporating the Crosstech moisture barrier are tested to ensure it is blood, body fluid and common chemical liquid penetration resistant. In addition, these gloves will be waterproof and provide the highest level of performance, durability and breathability.

In increasingly unstable and rapidly developing times, the threat to today's firefighters has never been greater. Fire gloves are developing just as fast – when hands are fully protected, confidence grows, and if this protection can come with dexterity too, then the firefighter has an essential tool in his modern-day armour.

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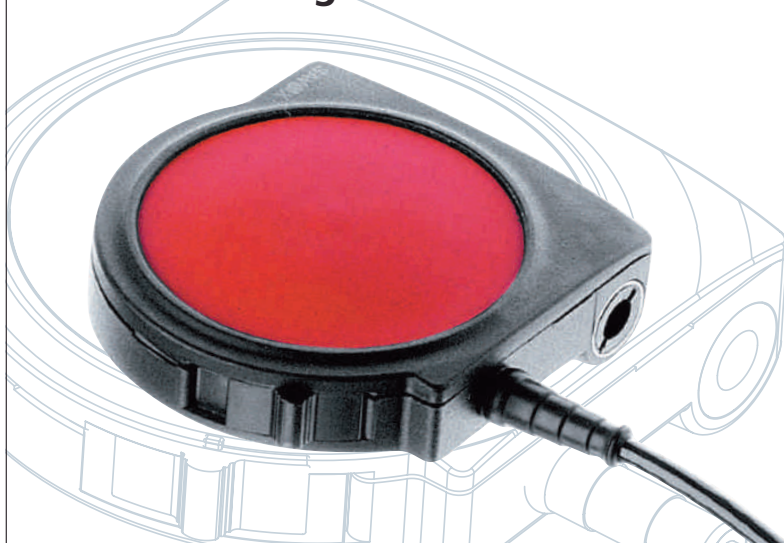
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Fire Fighting Monitors:

Selecting the Right One for your Application

Fire fighting monitors are used to apply water, foam or dual agents wherever there are large quantities of flammable or combustible liquids. Storage and process areas in the oil and petrochemical sectors are the most common applications. In the world of transport they are found on shipping and loading jetties, airport crash tenders, aircraft hangars and helicopter landing areas. Industrial applications include power stations and incineration plants. Monitors catering for all these different applications are available in a bewildering choice of designs, sizes, materials and nozzle configurations. Here Michael Mills of Angus Fire explains how to choose the right monitor for your application.

By Michael Mills

Product Manager,
Angus Fire

Storage facilities

Monitors are widely used for protecting storage tanks containing hydrocarbon and polar solvent flammable liquid risks. Fixed systems incorporate hand-operated monitors, geared monitors with hand wheels and oscillating monitors. These are used not only to apply foam on to fires but also to cool adjacent tanks. Flows of 4,000 to 7,500 lpm at 7 bar will normally achieve an adequate reach.

Supplementary cover is provided by portable and

mobile monitors. Small monitors can be designed to be carried by hand and placed on the ground to provide a rapid response in the event of a fire. They must be properly secured so they cannot move once the water flow and pressure is applied, usually by means of fire hoses and portable pumps. Portable ground monitors should combine light weight with stability, and be quick and easy to deploy and fold away. Light alloy models with 2½ inch inlet connections have capacities of around 1800 lpm at 7 bar but higher outputs can be



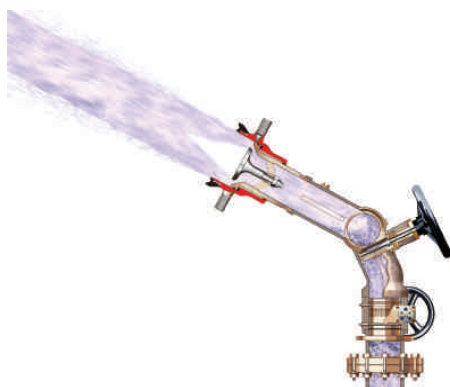
achieved by using an anchor spike on soft ground that helps to resist the jet reaction forces.

Larger hand-portable models with 3 and 4 inch inlets and capacities of 2,700 to 3,700 lpm at 7 bar are secured by means of an adjustable bipod arrangement. The throw is defined in terms of height and distance. For example, the Angus Titan will put foam on to the top of a fuel storage tank 20 metres high from a distance of 30 metres.

Moving up the scale, monitors such as the Angus Colossus with capacities ranging from 3,000 to 40,000 lpm can also be mounted on trailers. The mobile monitor can be used to reach areas not well covered by fixed monitors. Trailers are often fitted with outriggers to provide stability and water tanks on the trailer can be filled to provide additional weight for stability. Extra tanks can also be specified to provide foam.

Restricted access

In some applications, such as loading jetties or locations with explosive atmospheres, it is necessary to operate a monitor remotely. To do this motors are fitted to move the monitor body in the horizontal and vertical planes. In addition, if the monitor is fitted with an adjustable nozzle this will also need to be moved with a motor or actuator. Remote control monitors often need to meet the standards for operation in an area subject to explosive gases such as ATEX in Europe or NEC in the USA. Some applications require a master panel and slave panel arrangement, while others require feedback to show the operator where the monitor is pointing so that it can be operated even when



smoke obscures the view.

Remote control monitors are available with hydraulic or electric drives or a combination of both. Hydraulic motors have the advantages of low cost, simplicity, ease of maintenance and are usually explosive proof. There is no need to use limit switches on the motors since they simply recycle the hydraulic fluid without damage when they reach the limit of travel. Their compactness makes them ideal for marine jetty protection, ships, incineration plants and power generation. However, the maximum distance between the monitor and control panel is limited to 300 metres and there are no facilities for a secondary panel or position indicators.

Electric motors must have a mechanism to stop the current when they reach the limit of travel or they may burn out. Modern positioning encoders and electronic controls are today replacing the more traditional overload protection devices. Electric motors have the advantages of a possible master and slave panel arrangement, built-in encoders that will show the monitor position if required, and the distance between the monitor and master panel is unlimited. However, electric models can be expensive if explosive proof motors are necessary. Secondary panels in an explosive area also need to be contained in explosive proof casings.

For some applications, combined hydraulic/electric systems are preferred. In these the monitor is moved using hydraulic motors, but the hydraulic power is provided by individual hydraulic power packs mounted at the base of the monitor. The power packs are generally explosive proof. The advantages of this arrangement are that it combines the benefits of using hydraulic motors with the benefits of electrical control panels, retaining the option of a slave panel and no distance limitations between the master panel and the monitor.

Explosive environments

Monitors often need to be sited in areas where gases or flammable liquids that give off vapours are processed, stored or transported. While there is little risk of explosion when the liquids and gases are contained, it must be assumed that there is a risk of explosion if there is a breakdown, a release or a fire. To allow for this, specifications normally call for monitors and their control systems to be manufactured and approved to international explosion proof standards such as the European ATEX (ATmosphères EXplosibles) or NEC

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(National Electrical Code) in the USA.

Under the ATEX Directive most monitors will be sited in a "Zone 1" atmosphere where ignitable concentrations of flammable gases, vapours or liquids are likely to exist under normal operating conditions. Zone 1 requires monitors and control equipment to be "Group II" approved. A Zone 1 environment requires equipment classified as "Category 2G", where G stands for gas. The type of protection applied is defined by the CENELEC (Comité Européen de Normalisation Electro-technique) code. Ratings are described by a letter preceded by "EEx". An explosive or flame proof enclosure for a control panel intended for a Zone 1 area would be classed as "EEx d". In addition, the maximum surface temperature the equipment can generate is also added to ensure it cannot form the source of ignition for any gases present. The code "T4" indicates a maximum temperature of 135°C, which caters for most fire fighting requirements in industrial areas. Therefore, for a monitor used to protect a Zone 1 area, for example a hydrocarbon loading jetty, the ATEX approval should read "CE Ex II 2 II EEx d T4".

Under the NEC system, areas are firstly given a "Class" location for specific applications. Class 1 covers flammable gases, vapours or liquids. Classes are further divided into "Divisions". Division 2 is defined as "Where ignitable concentrations of flammable gases, vapours or liquids are not likely to exist under normal operating conditions". There is a further classification for the type of gas or vapour that may be present and their ignition temperatures. Most industrial groups fall under Groups C and D. Therefore, a typical monitor installed under the US classification system may be required to operate in a Class 1, Division 2 area in which gases in Groups C and D may be present.

The ATEX system became mandatory in Europe in July 2003 and reflects a more up-to-date method of working. It also takes into account a wider range of parameters than the US system. As a result, ATEX is a more comprehensive system and is therefore preferred for most fire fighting specifications.

Transport applications

A wide range of oscillating monitors is available which provides a powerful, sweeping water

stream for high performance attack and protection. These are used principally in aircraft hangars and on offshore helicopter landing areas.

Safety levels at airports have been rising in recent years thanks to greater use of advanced oscillating monitor technology in aircraft hangars. Fire protection for aircraft hangars, whether civil or military, has traditionally been based on NFPA 409. Generally the requirements have been for foam-water deluge systems incorporating sprinkler heads such as the Angus K40 supplemented by low-level oscillating foam monitors for under-wing protection.

But in recent years operators have been moving away from overhead sprinkler systems in favour of oscillating monitors mounted not only at low-level for under-wing protection, but also at high level for fuselage and over-wing protection. The main reason for this trend is the growing belief that most hangar fires occur at floor-level. It takes less time for foam to reach such fires from floor-mounted monitors than from sprinklers mounted on high ceilings. Monitors sweeping automatically through pre-set arcs of oscillation can cover vast areas of hangar floor space with foam within seconds of actuation.

The effectiveness of overhead sprinkler systems in extinguishing fires that occur inside parked aircraft has also been called into question. While the gentle downward flow of foam from sprinklers may be deflected by air turbulence created by such fires, oscillating monitors mounted at high-level ensure a more powerful and penetrating delivery of foam.

Another important consideration is that monitor systems require lower water demands and reservoirs, lower pumping capacity, and simpler piping arrangements than overhead sprinkler systems. In other words, they are simpler and cheaper to install, maintain and operate.

Automatic oscillating monitors are generally fabricated from bronze and are available in capacities of 4,000 to 8,500 lpm at 7 bar. The oscillating mechanism does not require filtered water and a broad oscillation angle is normally adjustable from 45° to 120°. The number, capacities and locations of oscillating monitors depend on factors such as the hangar layout, available water pressures and the aircraft parking areas requiring coverage. **IFF**

Michael Mills is Product Manager at Angus Fire, responsible for the global marketing of the company's Streamline range of fire fighting monitors. Angus Fire has been at the forefront of fire fighting monitor development for over forty years including fixed and mobile, manual and remote control, water and foam models. Angus Fire is part of UTC Fire & Security, a United Technologies Corp. (NYSE:UTX) business unit, which provides fire safety and security solutions to more than one million customers around the world. UTC Fire & Security is headquartered in Connecticut, USA.

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Air monitoring as part of preparedness

By Gerd Pearson

Global Market Manager
for Fire Brigades,
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Firefighters throughout the world know that the quicker they can assess what it is they are dealing with, the quicker they can start work. Smoke and flames are relatively easy to see, unlike the invisible dangers that often accompany toxic or flammable gases. A source of ignition at the wrong time, or entry into a potentially lethal atmosphere could turn an incident into a full blown disaster.

Even if every firefighter were to don compressed air breathing apparatus for every single incident, the need for gas detection systems would still exist. Gases, particularly those from chemical and industrial plants, can have far reaching effects, from the poisoning of nearby personnel through to widespread environmental pollution. They can also have explosive consequences. The use of the right gas detection system will quickly determine the type and level of risk and allow the firefighter to do what they do best – resolve the situation with the utmost safety for all concerned.

The nature of the incident can sometimes point to the type of hazard that may be found and might provide a useful insight into which type of

gas detection system may be required. An earthquake or other natural disaster, for example, might involve town gas, methane, hydrogen sulphide, sulphur dioxide, carbon monoxide or, perhaps, a lack of oxygen altogether. A terrorist incident might feature nuclear, biological or chemical hazards, whilst a wide variety of gases and vapours can be found at different industrial sites.

For instance, in the brewing industry where increased levels of nitrogen are now being used to make a more effervescent beer, there is a danger of oxygen depletion and, as a result, asphyxiation. Colourless, inert and odourless, liquid nitrogen is also used as a freezing agent in hospitals, laboratories and universities. A firefighter entering a

confined space or enclosed area in the danger zone could find him or herself with a severe case of oxygen deprivation.

In steelworks, a volatile mix of oxygen and carbon monoxide can create serious blast levels and even the semiconductor industry has its own potential toxicity problems with the use of ammonia, arsine and bromine. A "shout" at a food processing plant could involve high levels of disinfectants or, in refrigeration and cold storage areas, unhealthy levels of ammonia. To compound the problem, it is also possible that toxic and/or flammable gases and vapours that were created during previous work might still be present, or that hazardous bi-products may be created by the fire itself from otherwise non-hazardous materials.

Whilst not exhaustive, the following lists some of the most common substances that may be encountered:

SOURCE	SUBSTANCE
Combustion processes such as open fire, tobacco smoke. Vehicle exhaust gas	CO ₂ , CO, Nox
Cleaning agents, disinfectants, furniture polish, stain removers, shoe polish spray, nail polish remover, correction liquids, pickling agents.	Toluene and aromatics, hexane and aliphatic hydrocarbons, formaldehyde and other aldehydes, acetone
Glues and paints	Toluene and aromatics, hexane and aliphatic hydrocarbons, formaldehyde, other aldehydes
Insulating material, foams, damping material, chipboards	Styrene, formaldehyde
Gasoline stations	Toluene, benzene and other aromatics, hexane and other aliphatic hydrocarbons
Refrigerants, anti-oxidant in metal furnaces	Ammonia
Food processing, magnesium foundries	Sulphur dioxide
Semi-conductor manufacture & rework	Ammonia, bromine, hydrogen chloride, hydrogen cyanide
Paper and man-made fibres	Chlorine
Decomposing biological matter	Methane, H ₂ S, oxygen deficiency

Hazards and effects

Many gases and vapours are toxic, can cause oxygen deficiency or carry the risk of explosion and, as a result can prove to be lethal.

In respiratory terms, different hazards have different effects and are classified as follows:

Simple Asphyxiants

Inhalation of substances in this category is not usually life-threatening but the presence of a simple asphyxiant can displace oxygen in the air to such an extent that the lack of oxygen can, in itself, be dangerous. Carbon dioxide is a typical example and whilst exposure to low levels can lead to breathlessness, high concentrations can cause loss of consciousness within just 60 seconds.

Chemical Asphyxiants

Unlike other asphyxiants, these can be immediately dangerous to life and health in that they interfere with the transportation of oxygen within the body. Symptoms following exposure to carbon monoxide and hydrogen sulphide, which is produced by the combustion of polyurethane foams, for instance, include giddiness and headaches before eventual collapse. Exposure to a high concentration of

hydrogen sulphide will cause an immediate paralytic effect on the respiratory system.

Irritants

Ulceration of the throat, watering eyes, sneezing and coughing are just some of the immediate symptoms that can follow exposure to irritants such as ammonia, chlorine and sulphur dioxide. Where escape is difficult, breathing can become severely restricted and exposure could prove fatal.

Narcotics

Hallucinations can follow exposure to high concentrations of toluene and other narcotic substances such as tetrachloroethylene.

Combination hazards exist in many situations and, as well as being potentially explosive or flammable in nature can make search and rescue operations very difficult indeed.

Different types of systems

The incident and location will automatically reveal a certain amount of information about the types of hazards that are most likely to be found. However, firefighters entering a potentially hazardous environment need to know exactly which gases are involved there and then, not just for their own safety but for the well being of those they may need to rescue.

Designed to detect airborne substances and to sound a warning if the levels pose a threat to health, portable gas detection instruments can be used to determine if an area is safe to enter, whether it remains safe during rescue or recovery and, after clean-up, can ensure that decontamination has been complete. Whether the hazard is toxic, explosive, combustible, asphyxiating or a combination of any of those, there is an instrument to suit every situation.

Tubes

Short term tubes provide on-the-spot measurements of targeted gases and are suitable for monitoring personal exposure, spot check measurements, leak checks and confined space investigation. Developed by Draeger in 1937, for example, Draeger Tubes lead



the way in tube technology and enable the fast, accurate measurement of over 1000 substances, including chemical warfare agents.

These highly accurate glass tubes can also be used in conjunction with short term pumps to enable rapid measurements to be taken and provide optimum volume and flow specifications. Incorporating automatic stroke counters and a clear end of stroke indicator, pumps require no special tools and give accurate and reproducible results.

Personal Single Gas Monitors

These handheld instruments can monitor a broad range of gases and can be supplied with interchangeable sensors to detect specific substances. Portable instruments of this kind obviously

need to be lightweight, easy to read and easy to use, even when wearing gloves and the alarms should be heard, seen or felt in the most arduous of conditions.

Multi-Gas Measurements

These high performance instruments can be used to measure a wide variety of gases in virtually any situation, from indoor air quality through to confined space entry and the monitoring of landfill gas. The more modern units can provide continuous detection of up to five gases simultaneously and feature individually adjustable visual and acoustic alarms.

As each sensor is pre-calibrated and is recognised automatically by the instrument, this innovative instrument can be reconfigured simply

Designed to detect airborne substances and to sound a warning if the levels pose a threat to health, portable gas detection instruments can be used to determine if an area is safe to enter, whether it remains safe during rescue or recovery and, after clean-up, can ensure that decontamination has been complete.



by changing a sensor and without requiring additional service or maintenance. In addition, the measuring range of these sensors can be changed to any other gas detected by that sensor, by the push of a button and without needing recalibration. As a result, the accuracy and range of the monitored substance is substantially increased. The search for leaks in flanges, shut off devices and valves, etc., has also been simplified by the addition of a new, flexible gooseneck probe. When in tracking mode, it generates an increasing or decreasing rate of beeps in accordance with the gas concentration detected.

Domestic preparedness has come to the fore in recent years, as the dangers of chemical and biological agents have become more of a concern. Providing continuous measurement in real-time, the Draeger Multi-IMS, for example, is easy to use and will quickly detect a wide range of chemical warfare agents. Utilising the latest state-of-the-art handheld detection and monitoring technology, it incorporates a sensor based on Open Loop Ion Mobility Spectrometry and uses an ION Mobility Cell to provide improved sensitivity and selectivity. Concentration, trend and relative dosage measurements are easily taken and a range of graphical alarms indicate

both the substance and concentration level as well as the hazard type, i.e. nerve, blister or blood/choking agent. Bar graph displays clearly show the current concentration levels as well as alarm volume and battery status. With a built-in pump and RS232 datalogging interface, it also features audible and visual alarms and an automatic self-check.

Photo ionisation detectors (PID) are perfect for tracing volatile organic substances in air. Able to detect whole groups of substances, these multi-functional, robust instruments can also be calibrated to monitor individual hazards. Especially

It makes sense that sensors and sampling points are positioned so that gas accumulations are detected before they create a significant hazard. To ensure maximum performance, different sensor positioning strategies can be implemented to suit different workplace environments. Whilst these can, of course, be combined or modified, they are generally used to provide spot, area or perimeter monitoring.

Other specially designed “two-in one” instruments are also available for use where combination hazards involving explosive gases and a lack or surplus of oxygen may exist. For maximum flexibility, the Draeger PacEx2, for instance, can be supplied in two versions: as an instrument for explosive gas measurement, or as a “plug and play”, combination instrument for explosive gas and oxygen measurement. Combining extended operational time with minimal training and charging requirements, it features “smart” technology and is designed to monitor hazard concentrations continuously, simultaneously and independently.

Utilising three functional pushbutton controls, this rugged instrument is operational as soon as the sensors are plugged into the instrument and has a short response time.

Each of these multi-functional instruments can also be fitted with a hose or pump for active sampling in hard to reach areas. Where record keeping is a requirement, they can also be supplied with dataloggers.

useful in confined space measurements and emissions monitoring, they can also assist in fire investigation and in post-accident screening.

Fixed Gas Detection Systems

Designed to constantly monitor and detect explosive or toxic gases and vapours as well as oxygen deficiency and/or enrichment, these sophisticated systems can be used to sound alarms and initiate evacuation, or to switch off entire processes in the event of a problem. Used to monitor remote areas and/or multiple sites, their data is recorded which means that they can provide valuable incident information before fighters even arrive at the scene.

Providing round the clock protection for, amongst others, the petrochem, food processing and chemical industries, they are also widely used in large commercial sites and sports or leisure venues.

Firefighters have a need for rapid and accurate information about the nature of the incident.

Once armed with the facts, they can respond to the numerous challenges that arise both quickly and competently. Fulfilling a vital role, gas detection systems can be used to eliminate the risks and increase awareness of the dangers.

Useful information for firefighters – sensor positioning

It makes sense that sensors and sampling points are positioned so that gas accumulations are detected before they create a significant hazard. To ensure maximum performance, different sensor positioning strategies can be implemented to suit different workplace environments. Whilst these can, of course, be combined or modified, they are generally used to provide spot, area or perimeter monitoring.

Spot monitoring is used where the potential source of the leak is known and the sensors can be positioned to ensure that leaks are detected quickly. Area monitoring requires an increased number of sensors to cover an entire area and is generally used where the source of the leak is not known. Perimeter monitoring is used in applications where the outer limits of the installation need to be checked and where it is important that potential hazardous gases do not reach neighbouring areas.

European Standard BSEN 50073:2000 lists a

number of factors that should be taken into account when determining suitable locations. These include the location, i.e. indoor or outdoor site, potential sources such as the location and nature of the potential vapour/gas sources (pressure volume and/or mass, source temperature, density and distances), as well as the chemical and physical data of the potential gases/vapours present.

Other factors include leak control, the nature and concentrations of possible gas releases, the presence of cavities and jets and the general topography of the site. Air movements should also be taken into consideration as well as temperature effects, the local environment of the plant, the location and number of personnel in the plant and the location of potential sources of ignition. Any structural arrangements such as walls, troughs or partitions, which could allow gas to accumulate, should also be considered.

Perhaps most importantly, the Standard also states that the placement of the sensors and sampling points should be determined following the advice of experts having specialist knowledge of gas dispersion, experts with a knowledge of the process plant system and equipment involved, and safety and engineering personnel. It also advises that the agreement reached on the locations of sensors and sampling points should be recorded.

IFF

Further information is available from:

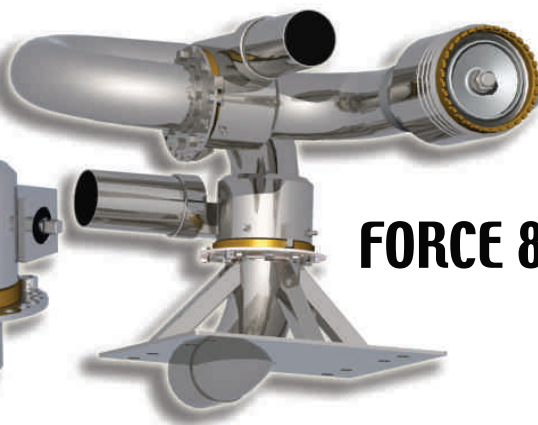
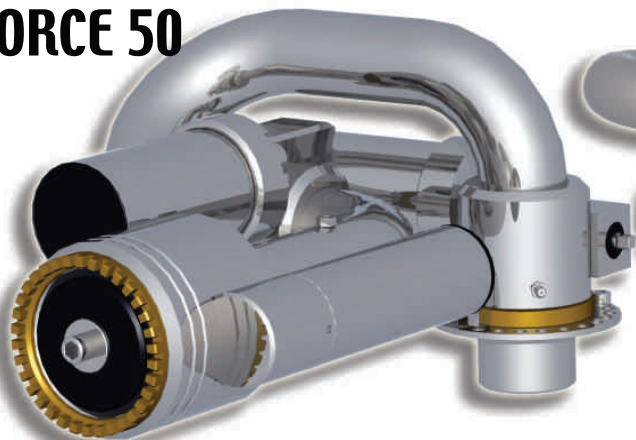
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Pic courtesy of Angus Fire



Large-diameter Hose Solutions for Emergency Water Management

By Mike Willson

Product Manager,
Angus Fire

The ability to deliver water supplies where and when they are needed, in sufficient quantities and at the right pressures is today a major operational issue for municipal, industrial and aviation fire and rescue services worldwide.

Making the most of limited water supplies in rural locations is often difficult for municipal fire services because of the pressure loss problems encountered with standard fire hose. New ICAO regulations mean that airport fire services need to make provision for additional water supplies for use in fire fighting following an aircraft accident. Industrial fire services are also finding that ordinary fire hose is insufficient for feeding the latest large-capacity foam/water monitors for storage tank fire fighting.

Relay pumping outdated

Traditional solutions have centred around using existing hydrant ring main systems, bulk water storage tanks and relay pumping. Unfortunately these all have fundamental limitations. Hydrant ring mains are often old, poorly maintained and can be ruptured in an explosion. Bulk water storage

tankers offer limited volumes of water and require good road access. Relay pumping can take up valuable resources in terms of manpower and vehicles and is only as reliable as its weakest link. In addition, relay pumping often generates the safety hazard of the "spaghetti effect" on the fire ground due to the many hoses needed to supply large volumes of water at sufficient pressure. This is because the pressure loss down a fire hose increases rapidly when the flow is taken above the normal acceptable limits for a standard diameter. For example, flowing 800 litres/minute of water down a 64 mm hose will produce a pressure drop of 5.6 bar over 200 metres. Imagine trying to move 20,000 litres/minute of water 1000 metres down 64 mm hoses. It is a logistical nightmare! Fortunately, the spaghetti effect can now be a thing of the past with modern Large-Diameter Hose (LDH), sometimes called Hi-Volume systems or Hi-Vol for short.

Pic courtesy of Angus Fire



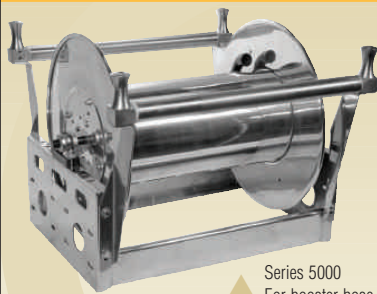
LDH is the answer

The good news is that by increasing the hose diameter, the pressure loss can be greatly reduced. A 1% increase in hose diameter results in a massive 5% drop in pressure loss. In practical terms, this means, for example, that a 125 mm diameter LDH can move the same amount of water, the same distance, with the same pressure

loss as eight parallel 64 mm lines!

In order to exploit the pressure improvement benefits of increasing the hose diameter, hose manufacturers offer a range of LDH 4 inch (102 mm), 5 inch (125 mm) and 6 inch (152 mm) diameter hoses, as well as eXtra Large Diameter Hoses (XLDH) in 8 to 12 inch (200 to 305 mm) diameters. These products solve the pressure loss

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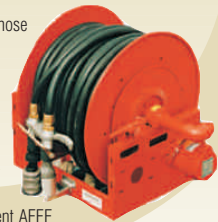
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problems at a stroke, but they need to be handled properly.

Nylon construction

LDH hose is no different to other layflat hoses in that they are available in a range of qualities from several manufacturers. However, the larger the diameter the more critical the hose construction becomes as there are larger volumes, weights and pressures on the fabric of the hose.

Polyester yarns are sometimes used, but these are more likely to result in kinking as they do not stretch under pressure. They are also unable to maximise the pressure savings down long lengths of LDH as they cannot swell. Swell is a special characteristic only found in Duraline type hoses with an all nylon jacket. Nylon is special in that it can be stretched slightly in use without breaking. This allows the best LDHs to minimise kinking, even at low operating pressures and also achieve swell, which allows the hose to stretch slightly and pass more water with lower pressure losses than polyester yarn hoses.

LDH should be made from specially formulated rubber blends designed to resist abrasion, heat, chemicals and oil during operational use; and UV,

There are now sufficient sites around the world protected with LDH that the groundbreaking engineering work needed to produce a total solution to overcome the difficulties has been achieved.

ozone and weathering during storage. This special rubber is extruded through the nylon textile jacket to make a very durable long-lasting LDH. Such hoses are generally used with Storz couplings, now the established standard coupling for LDH.

Manual handling superseded

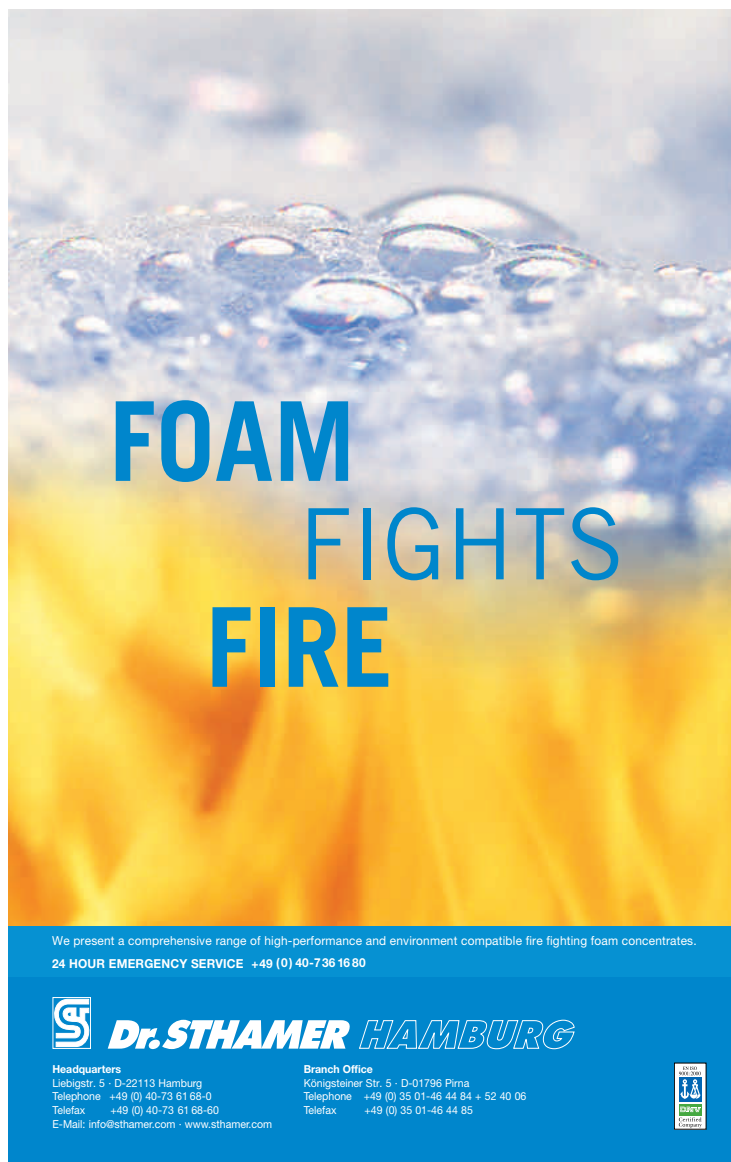
In many cases LDH has been handled manually, but with current Manual Handling Regulations in Europe long lengths can put fire fighters at risk of injury due to the heavy weights involved. New cost-effective deployment and retrieval solutions are now available that take the physical effort out of using LDH, with a resulting dramatic increase in its popularity and usage. Leading municipal, industrial and aviation fire and rescue services now use LDH as a standard tool in their armoury. It can be deployed quickly at an incident and quickly retrieved using Fast Efficient Techniques for Collecting Hi-Vol (FETCH) hose systems. Fire fighters can now easily lay out a temporary ring main of LDH to reach less accessible areas and feed operational personnel with reliable water flow and pressure requirements.

Planning hose configurations is carried out using a HoseCalc software program. Simply enter a hose configuration and HoseCalc carries out the pressure loss calculations to give an outlet pressure.

To store, deploy and retrieve over 1 km of

150 mm hose sounds like a major system design exercise, but with these reliable modern deployment and retrieval systems it is quick and easy to complete the task. There are now sufficient sites around the world protected with LDH that the groundbreaking engineering work needed to produce a total solution to overcome the difficulties has been achieved and FETCH is largely responsible for this significant advance. Anything up to about 4 km of LDH is normally stored flaked in a truck or demountable storage pod system. Most pod systems have a central walkway for ease of access. The hose is layed out at high speed simply by opening the rear doors of the pods, pulling out the first hose coupling manually, and then driving the vehicle forward. The hose cascades down on to the ground and is fully deployed in a matter of minutes.

After an incident the FETCH automatic recovery system enables the hose to be picked up from the



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Pic courtesy of Angus Fire



ground while the vehicle is driven slowly forward alongside it. It brings the Hi-Vol back into the storage pods with the minimum of physical effort, avoiding fatigue and injuries during emergencies and training exercises. For the first time swift deployment and rapid retrieval are achieved with the minimum of effort. Off-road versions are also available.

Custom engineered

FETCH systems are supplied as assembled skids enabling fire services to custom engineer them into their own vehicle preferences and budgets. Vehicle layouts may be sub-contracted to a third party, built on a modified chassis by fire services engineers or designed and built by a vehicle manufacturer.

FETCH enables fire and rescue services to operate well within the Manual Handling Regulations. Gone are the days when fire crews would be expected to lift coils of hose that can weigh more than 50 kg each. With FETCH it can be done much more quickly and with less manpower.

Mounted on the front offside corner of the WSU, the compact FETCH system comprises a simple but cleverly designed twin-roller friction system. One of the large-diameter rollers is rubber-coated and the other drives a high grip conveyor belt. Drive to the rollers is provided by a geared chain, which in turn is driven by a diesel-driven hydraulic power unit fitted to the vehicle chassis.

The unit allows couplings to pass through it without the need for any complicated electronic sensors. Most fire and rescue services want a

simple design with as little as possible that can go wrong in an emergency, and if anything does go wrong they want to be able to repair it quickly in the field. FETCH has achieved this by leaving unnecessary complications out of the design that would only have made the unit less reliable and affordable.

A vehicle fitted with FETCH is capable of recovering 1 km of hose in about half an hour with minimal manpower. Water drains from the hose enabling it to be stored flat in the containers. It can also feature a special electric start diesel power pack fitted with engine over-speed shutdown system and spark arrestor exhaust that allows a vehicle to be operated in hazardous areas.

Quality LDH essential

These water management solutions are designed for emergencies, which it is hoped will never happen. This means the hose is likely to spend the majority of its life in storage, probably in a flaked condition. This puts the hose under a great deal of stress, particularly along the fold. Therefore, in exactly the same way as it is critical to choose a well designed and manufactured fire hose for first-attack fire fighting, LDH and XLDH products must

**The flexibility and efficiency
that modern LDH solutions now
offer means that there is a
flexible mobile solution
available to help fire fighters to
meet these tough challenges.**

be chosen with care. For LDH hose BS6391 Type 3 is the international standard to choose for your assessment criteria. Buying the cheapest hose on the market can mean that three years down the track, when maybe it is first used in an emergency, it could let you down badly and potentially put fire fighters' lives at risk. By seeking out a manufacturer with a proven track-record of supplying LDH that exceeds the requirements of BS6391 Type 3, has technical expertise in XLDH products, and makes its own deployment and retrieval systems, you are far more likely to achieve a reliable long term solution to your water supply problems.

Conclusions

Today's fire fighters need optimum flexibility. They can be called upon to assist in many kinds of emergency, including flood control and disaster relief including earthquake situations where all the established water ring main systems are broken and disrupted. Even under such demanding conditions fire fighters have a responsibility to be able not only to maintain an adequate water supply, but also to deliver ever increasing quantities of water to deal with the more complex hazards we see in the modern world. The flexibility and efficiency that modern LDH solutions now offer means that there is a flexible mobile solution available to help fire fighters to meet these tough challenges, and help them to maintain and optimise supplies of water in the widest range of emergency scenarios.

IFF

Mike Willson is Product Manager at Angus Fire responsible for the global marketing of Hi-Vol Large Diameter Hose (LDH) and associated FETCH deployment and retrieval systems. Angus Fire is part of UTC Fire & Security, a United Technologies Corp. (NYSE:UTX) business unit, which provides fire safety and security solutions to more than one million customers around the world. UTC Fire & Security is headquartered in Connecticut, USA.

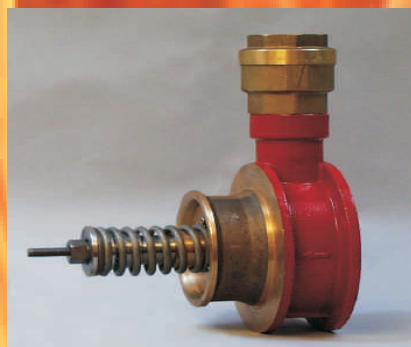
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Airport firefighters dealing with simulated engine fire



Training for a safer world with Serco's International Fire Training Centre

Serco's International Fire Training Centre (IFTC) based at Durham Tees Valley Airport has been training firefighters from various sectors for the last sixty years. Established in 1948, primarily for the aviation sector, it has evolved into delivering training for aviation, offshore, industrial and maritime sectors.

By Tim Oakes

Business Development
Manager, IFTC

From its original home of Pengan Moor in Cardiff a move to Stansted then finally to Durham Tees Valley Airport (formally Teesside) in 1981, IFTC has grown in reputation world wide as a deliverer of first class fire training.

With its team of sector professional instructors and dedicated technical support team, who are supported by administration, finance and Information Technology, delivery of the training meets the various awarding bodies' criteria or organisations' customised needs.

The Centre is equipped with its own residential accommodation, restaurant, bar and fitness facilities, therefore delegates have plenty to do in the evening to relax after an intensive day's training. These superb facilities are the hallmark of IFTC's capability to offer a one stop training solution.

With an extensive fireground covering over 18

acres and a wide range of simulators to meet all clients' training requirements, IFTC can truly be classified as International as it boasts a client base of over ninety different nationalities who have trained at IFTC. At the time of writing Firefighters from the British Virgin Islands, Portugal, Greece and Nigeria were attending IFTC on various training programmes.

Training simulators include four aircraft fuselages, a light aircraft, military aircraft both fixed and rotary wing. There is also the front section of a 747 aircraft. Other training facilities include restricted space units, accommodation buildings, chemical and fuel distribution plants. Part of the multi-training rig are several rooms, with various fires, a chemical rig and a tanker loading bay. As part of the multi-rig there is a simulated Heli-deck with monitors and other fire

Teams bending the flames



fighting equipment, again to create as realistic conditions as possible.

The training simulators can burn kerosene or Liquid Petroleum Gas (LPG). This allows IFTC to create realistic conditions, but also to be focused on the Environmental issues. With this in mind we have a water treatment facility consisting of a reed bed system which allows us to treat our own water run off from firefighting, re-cycle it and re-use once it has gone through the treatment process.

Aviation

IFTC is the UK's only Approved Training Provider (ATP) to deliver all the Structured Learning Programmes as required by the UK Civil Aviation Authority to meet CAP 699 Standards for competence of Rescue & Firefighting Service (RFFS) personnel employed at UK Licensed Aerodromes. The training delivered also meets the requirements of the International Civil Aviation Organisation (ICAO).

The programmes are designed for the role and task of airport firefighters, Supervisors and Managers. The role of Supervisor can then be broken down further to the roles of Crew Commander, Watch Commander and Lower Category Aerodrome Supervisors. Each programme has been designed to deliver both the relevant technical and practical training within the role and responsibility.

All acquisition programmes must be conducted at an ATP and on successful completion individuals are issued with a certificate of competence which is valid for four years. Further to this an airport can then continue the development of their staff through a maintenance of competence scheme approved by the CAA or following on from a station training programme return to IFTC after a four year period for a practical based assessment programme.

The Firefighter Initial programme is 6 weeks in duration and covers practical drills, firefighting medias, aircraft construction, aircraft incidents, breathing apparatus and First Aid just to mention only a few of the subjects covered. Assessments are through observation, written and verbal tests.

The Supervisor Structured Learning Programme looks at various legislative aspects, managing resources, Health & Safety aspects plus command and control at an aircraft accident/incident. All are concluded with technical and practical assessments. This SLP is of 3 weeks' duration.

An intermediate course involves the command and control elements for Crew Commanders – individuals who may be in charge of an appliance.

This develops Commanders in the area of Command & Control by the utilisation of a Virtual reality Simulator. This allows Commanders to go through the decision making process in a safe

environment, on a variety of Aircraft and different incident scenarios.

Training for Command and Control at major aircraft accidents/incidents is enhanced by the use of a unique Command and Control virtual reality simulator (ETC) which uses a team approach. The ETC Command and Control Simulator installed at IFTC is the only one of its kind, configured specifically for UK RFFS operations. Its purpose is to provide real time opportunities for Watch Commanders and Crew Commanders to make operational decisions that are difficult, or at times, impossible to arrange in any other way.

The main advantage to using the system is that command training is carried out in a safe environment, that it can be used, if necessary, to repeat training exercises, to reinforce training outcomes and that it incorporates elements within scenarios that cannot easily be replicated on a training ground.

Further to this, the degree of immersion achieved using the system is considerable. As a result, Commanders find themselves making decisions in a high stress, high stakes, high risk, time pressured environment. It is exposure to exactly these sorts of pressures that help Commanders to develop a form of naturalistic decision making,



The application of dry powder by offshore teams



BA Teams entering alc for search purposes

Offshore teams applying foam



referred to as Recognition Primed Decision Making (RPD). Much work has been carried out in the field of command psychology that is providing evidence Commanders really need the ability to make lots of pressurized decisions, in order to positively enhance their operational decision making skills.

We are sure from our own experiences in training and developing UK Aviation Commanders that the research published to date is valid.

The system can be configured to offer 1, 2 or 3 vehicle airport fire services and up to ten operational staff. The aircraft available reflect the range of types in everyday service, from B747 down to a Cessna 152. All types of weather conditions, at any time of the day, can be built into what amounts to an infinite number of emergency scenarios.

Offshore

In association with FalckNutech IFTC also runs training programmes to meet the requirements of Offshore Petroleum Industry Training Organisation (OPITO) these include Team Leaders, Members, Helideck Teams and combined teams. These are delivered as either initial or refresher courses. Other bespoke training includes company specific training and programmes which are designed with the clients to meet their training outcomes.

Petrochemical/industrial

These programmes are run for company specific training or to meet the requirements of the Joint Oil and Industrial Fire Forum (JOIFF). As an accredited provider it is imperative that we meet both the standard requirements and the needs of organisations.

Other training courses

IFTC can offer a wide range of training programmes, from Management accredited by the chartered management Institute (CMI), Train

the Trainer, Cabin Crew fire & smoke and Fire Awareness.

Future developments

With the introduction of the Cat 10 aircraft, IFTC have delivered the first phase of a multi million pound investment with the installation and commissioning of a purpose built of CAT 5 simulator and enhancements to the water treatment facility. The second phase will consist of another simulator which will have the front section of a Cat 10 aircraft and the rear section of a Cat 7/8 aircraft. With the other aircraft fuselages and simulators IFTC will have the unique capability of delivering training to meet the full range of present aircraft that use airports throughout the world.

To complement the arrival of this aircraft simulator and the Cat 5 simulator delivered and installed in December 2006, IFTC has also purchased two new fire training vehicles which will be delivered late 2007.

IFTC is proud to be considered a Centre of Excellence for fire and related training. IFTC is actively involved with the Airport Operators Association Rescue & Firefighting Services Working Group (AOARFFSWG) and is a member of both the Airport Fire Officers Association (AFOA) and International Aviation Fire Protection Association (IAFPA). It is working with these organisations that ensure IFTC delivers not only training to meet regulatory requirements but the requirements of industry.

In recognition of the individuals efforts when attending the training centre IFTC holds an annual awards evening with winners being presented from the various acquisition programmes as well as the top Breathing Apparatus Instructor and top UK airport. This is a prestigious event and an evening of celebration for the achievements of the individuals. All awards are sponsored by organisations involved with the aviation industry.

IFF

Divisional Officer **Tim Oakes** is the Business Development Manager at IFTC. Commencing as an Instructor in 1989 Tim has progressed through the ranks to his current position. He previously worked for British Aerospace and served for 10 years in The Royal Air Force Fire Service.

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Texas Engineering Extension Service

A school bus carrying young schoolchildren has been struck by a train in a rural area. When the first responders arrive, there are screams coming from the mangled yellow wreckage. Two children are still in the bus, trapped by twisted metal and bleeding profusely.

Knowing that hydraulic rescue tools are almost 40 minutes away, the responder runs to his vehicle, removes a battery-operated saw from his emergency kit and begins to cut through the metal to reach the children. Only three minutes into the cut, and several inches from finishing the rescue, the batteries fail.

Fire, rescue and law enforcement agencies throughout the world are equipping emergency responders with tools to save lives, but will that equipment work when lives are hanging in the balance?

**By Clint Arnett and
Chuck Klafka**

Co-project coordinators
for TEEEX

This is the question we are asking at the Texas Engineering Extension Service (TEEX) in College Station, Texas. The scenario above is just one nightmare that haunts us and keeps us focused on the goal. Our goal is to make sure every emergency responder and emergency manager has the information they need to make the best decision about the tools and equipment they purchase – the tools they depend on when the proper tool can save a life.

And more and more, TEEX is working with the manufacturers of emergency response equipment to improve the safety and effectiveness of their emergency and rescue tools.

With the rash of manmade and natural disasters

of the first decade of the 21st century, billions of dollars have been allotted around the world for rescue tools and equipment. Yet, most have no way to evaluate whether the equipment will actually perform as expected.

Serving the emergency community

We have another reason to be concerned about emergency response equipment. TEEX trains more than 81,000 responders from all 50 states and 45 countries each year in the latest techniques of emergency management, firefighting and rescue. As part of The Texas A&M University System, TEEX is the home of the 120-acre Brayton Fire Training Field and Disaster City®, a mock community



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featuring full-scale, collapsible structures designed to simulate various levels of wreckage. TEEX is also home to Texas Task Force 1, an acclaimed urban search and rescue team that has seen deployment to some of America's worst disasters, including 9/11.

TEEX is just one component of the Texas A&M Engineering Program, which is recognized as one of the most comprehensive and diverse engineering programs in the United States, focusing on education in engineering and applied sciences, research and outreach. Other components of the program include the Dwight Look College of Engineering at Texas A&M University, the Texas Engineering Experiment Station (TEES) and the Texas Transportation Institute (TTI).

Through the unique marriage of these components, Texas A&M Engineering is able to bridge between academics, research, training and outreach, and promote interaction among universities and agencies within the A&M System as well as with other state, federal and industry partners.

Ask the professionals

Because thousands of responders train at TEEX's College Station campus every year, we have the opportunity to ask the men and women in the field what they need to do their jobs effectively.

In addition to querying these professionals, TEEX brings together subject matter experts (SMEs) several times annually to determine what devices should be tested, and what is most important about each tool for use under actual conditions. The majority of our SMEs have 15 or more years of service as firefighters or law enforcement officers and were involved in some of our nation's greatest disasters: 9-11, Oklahoma City, and hurricanes Katrina and Rita.

Before conducting an assessment, we conduct focus groups. Comprised of 8-10 rescue and law enforcement personnel from different departments throughout the country, this group discusses rescue situations and the devices that are needed, as well as identifying different scenarios in which the equipment might be used. Is the item waterproof and drop resistant? Can responders change the batteries with gloved hands? Are there too many buttons to identify in low-light conditions?

It isn't unusual for some items, such as saws and other cutting and extrication devices, to be purchased straight off the shelves of local hardware stores or through the Internet. Through our product testing, we give departments the information they need to purchase tools that will perform when lives are at stake.

TEEX also conducts a market survey on the item. The tool is researched through the Internet, catalogs and technical publications, and we produce a report with a list of the products available to do that specific job.

Today, many manufacturers build items that are market-driven. Market surveys decide what items sell at the highest margins and manufacturers may design a tool based on those statistics. Unfortunately, a saw or camera that works well on paper may not work well in the heat of a rescue. Through our testing, we can not only provide valuable data to consumers, but also help the manufacturer improve the product.

Many times our market surveys return interesting results. For example, although not designed for rescue use, a bird-watching camera might fit the same technical specifications as a rescue camera. We endeavor to test all similar items because occasionally tool systems from other industries have been found to have significant applications in the emergency response realm.

With the information gained from the focus group and other responders, we bring in our own engineers to decide whether credible data can be obtained on the items. Texas A&M engineers set

cardboard box with a plastic handle on it and foam inserts rather than something sturdier. When any consumer orders an item designed to be used in the field, especially something that costs in excess of \$10,000, they expect the case to be more than cardboard. After we pointed it out to the vender, they agreed and sent us a much tougher case for the item.

Unfortunately, many items that showed great promise according to manufacturer's marketing materials, failed to deliver. If an item fails during testing and it's under warranty, we make a claim and track how the manufacturer handles the process. We send it back to them and wait for a replacement as the clock continues to tick. We

**If an item fails during testing
and it's under warranty,
we make a claim and track
how the manufacturer
handles the process.**

the parameters of the tests, supervise the testing and later write the final report. If the engineers agree that we can obtain good data, we look at the market and reduce the list to a manageable number of items that can be procured and tested.

Step-by-step testing

Every stage of the testing process is designed to emulate the procedures that departments and agencies worldwide might follow when purchasing equipment. We don't inform the manufacturers of the tests, and we acquire the products through regular procurement channels.

As in many jurisdictions, items over a certain dollar amount must be put up for bid, and although the manufacturers and distributors don't know it, the clock is already ticking. We track how long it takes to receive the item, the cost of the item and if they ship the correct product.

If we receive the wrong product and have to return it, we judge how well the manufacturer handled the mistake, and how quickly and professionally the error is corrected.

We also look closely at whether the product we receive matches the company's marketing information. As an example, one product advertised that it included a case. What we received was a fancy



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track the entire process from start to finish and record the results.

Sometimes manufacturers have questions for us. We've been called by companies who want to know why their specific piece of equipment wasn't included in a test. In one case, the item was included in the initial procurement order but because of the manufacturer's inability to deliver it before the test cycle began, it wasn't included in the results.

We strive to take an international, all-hazards approach to our testing, and make our assessments relevant to responders of all nationalities and disciplines.

Taking a tactical approach

In addition to fire & rescue equipment, and extrication tools, we evaluate law enforcement equipment as well. While firefighting tools are focused on saving lives as quickly as possible, law enforcement tools are tactical, and may be used in areas where there is anticipated combat.

For example, an individual might be barricaded in a building where there is a fire developing. It is important to pacify the individual so that fire personnel can enter the building to fight the fire and rescue others that might be trapped in the building.

Even though we may be testing the same piece of equipment, law enforcement may use it differently. For example, a Powered Air Purifying Respirator (PAPR) is used by both rescue and law enforcement personnel. During testing, we discovered that wearing a PAPR facemask makes it difficult to aim a shoulder weapon, such as a rifle or shotgun. Other PAPR units were found too noisy for law enforcement use.

This useful information allows departments to modify their training so that their officers are aware of the problem and can compensate. It has also allowed the manufacturers to modify certain models to make aiming shoulder weapons more accurate when wearing the mask.



We've also tested spike strips, which are placed on roadways in front of fleeing vehicles. With the help of the Texas Transportation Institute, we were able to place sensors in the tires of test vehicles to measure the effectiveness of different spike strips. Through testing, we are able to determine the order and rate of tire deflation.

We also discovered that certain models lose their effectiveness if they are not deployed on a hard surface such as asphalt or concrete. This is very useful information for rural jurisdictions and border agencies, which might tend to deploy the spike strips on dirt or gravel roads.

Testing under real conditions

Testing is normally a five-day event held at our facilities in College Station, such as Disaster City®. Our facilities and resources allow us to test the tools and equipment in realistic emergency conditions. Our rubble piles contain items you would find in a real building collapse, like concrete, rebar, conduit, wires and wood. We send responders wearing full equipment into that environment and test how effectively they can use whatever item is being tested. We also have facilities that simulate rain, heat and other environmental factors.

Other testing occurs at our facility at Texas A&M's Riverside Campus, located at the former Bryan Air Force Base. Working hand-in-hand with the Texas Engineering Experiment Station (TEES) and Texas Transportation Institute, at Riverside we have thousands of feet of abandoned runways for spike tests and the space to assemble identical trucks or school buses to test cutting and extrica-

tion tools, as well as a demolition range.

Our test results are operationally relevant because we test the equipment using responders who are in the field everyday. Using real responders not only gives our testing the necessary but often overlooked perspective of the end users, it also gives our test results instant credibility within the responder community since the testing was done by peers and colleagues.

We also work closely with the Texas A&M University Department of Engineering. Professional engineers not only supervise the testing, but also write the reports. Before the data is published, it is vetted by a final review board made up of outside engineers and scientists who verify our data and procedures.

Future plans

We are continuing to add clients in both the public and private sector. We are particularly excited about new relationships we are forming with manufacturers who understand how our test data can help improve their products. Companies worldwide are realizing that our SMEs and the other responders we work with throughout the year are a vital asset to a company's research and development, helping product developers understand what's important and what's not.

We can provide responder input beginning with product design, through prototype testing and beyond. This data from responder testing, in close to actual conditions, will make for safer, more effective products, so emergency responders will have effective tools to save lives. **IFF**

Clint Arnett and **Chuck Klafka** are co-project coordinators for TEEEX. Clint handles the emergency and rescue side of the testing program and Chuck works from the law enforcement side. Clint worked with heavy tools and equipment for 17 years before joining TEEEX in 2004. Chuck came to TEEEX after 30 years as a special agent with the FBI.

For queries or further information regarding our testing programs, please contact:

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Urban Search and Rescue Division

at 979-458-0857

or via e-mail at Clint.Arnett@teexmail.tamu.edu or

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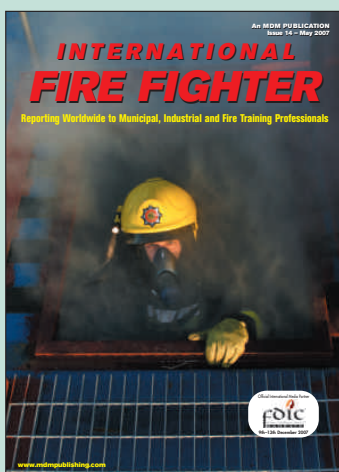
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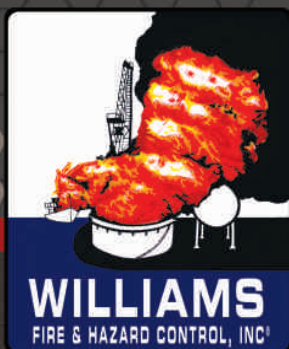
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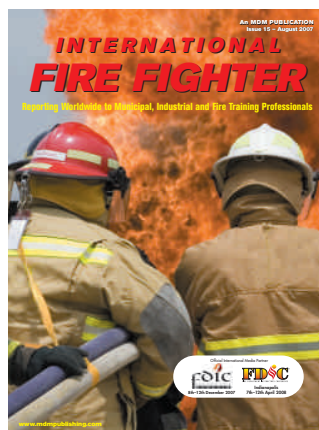
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In support of the event, Kidde Fire Trainers and the Southside Fire Company arranged to have the Mobile FireTrainer® present. The 48-ft long, 2-story training trailer exposes firefighters to the intense heat, flames smoke and chaos of a real fire emergency. However, unlike a real emergency, these computer-controlled, propane fueled fires can be started and extinguished by an instructor at the touch of a button, ensuring trainee safety.

The trailer has specialized features, such as a pitched roof, a 2nd floor room, a staircase, doors, windows, a forced entry door, and repositionable interior walls to simulate features found in a typical house or building fire. For added realism, the trainer's interactive sound system can replicate sounds like an explosion noise or a victim's call for help.

The Southside Fire Company in Riverside, PA recently purchased the ML-1000 using federal funding from the 2006 Assistance to Firefighters Grant program. The trainer was then loaned to the NY State Fire Chief's



Association for their training.

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Email: louis.orotelli@kiddeftr.com

New Super Light Spreader from TNT Rescue Systems, Inc.

TNT announces their new line of Auto Extrication Spreaders; the SL-32 is the second spreader available in this series. This new spreader provides the user with the forces they need in a super light package. Weighing in at a mere 38.5 lbs (17.5 kg) this spreader is the lightest in its class, a reduction of 31% from the comparable S-100 series spreader. The maximum opening is 32 in. (813 mm) at the tips where there is a maximum spread force of 29,450 lbs (131.1 kN). This tool measures 31.9 in. (810.3 mm) in length, 7.0 in. (177.8 mm) in height and 13.2 in. (336.6 mm) in width. The SL-32 spreader is well balanced for ease of operation and offers the true variable speed control (TVSC), as well as a wrap around D-



handle. As with all TNT products, this spreader is covered by a comprehensive lifetime warranty and service from an extensive customer service network.

For more information, please contact:
TNT Rescue Systems
Tel: +1 920 474 4101
Fax: +920 474 4477
Email: email@tntrescue.com
Website: www.tntrescue.com

Akron Brass Introduces Key Industrial Firefighting Products



AKRON BRASS announced today the introduction of two key new industrial firefighting products at the 2007 National Safety Conference of the National Petrochemical and Refiners Association.

For industrial fixed site applications, Akron unveiled their new Style 3530 Elevated Manual Monitor. Its unique design features the most compact, simple, and efficient elevated monitor on the market today. Most importantly, all this is achieved without compromising the traditional superior performance of Akron Brass products.

Made with corrosion resistant materials throughout, the new 3350 is available in 10-, 15-, and 20-ft heights. With a flow rate up to 750 gpm, it features an optimized nozzle design with trouble-free pattern actuation, an integral stream shaper, and excellent reach (235 ft at 750 gpm). For rugged reliability, it has a maintenance free rotation joint design and includes a 5-year warranty as standard.

Next, Akron Brass introduced their new generation Style 3528 Omega XP monitor. Building upon a successful global legacy with their Omega, Akron has made enhancements to update this workhorse product.

For marine and industrial environments, the Omega XP has durable brass construction for corrosion resistance and



cast-in turning vanes for more efficient flow (maximum flow is 1250 gpm). One leading change is an enhanced design for less tip weight which translates to lower handle operating force. Additionally, a unique locking mechanism provides the means to hold the desired monitor position. A 5-year warranty is standard with new 3528 Omega XP as well.

For more information about any of the new Akron Brass products, call your local authorized Akron Brass Industrial Distributor or the Akron Brass Customer Service Department at 1-800-228-1161

Special systems available in Germany for separation of oil/water mixtures

4th INTERCON in Hamburg from 13 to 15 September 2007

Increases in shipping traffic bring with them a greater risk of oil tanker accidents causing major environmental damage. The fire services and THW (Technisches Hilfswerk, i.e. German Federal Agency for Technical Relief) now have facilities to separate oil/water mixtures, with a special separating system (SEPCON), in readiness at the German coasts and rivers. Where necessary, operations can also be conducted in neighbouring countries. A total of four mobile systems are maintained – systems that are unique in Europe, as underlined by Gerhard Plickert of the Hamburg Fire Brigade in advance of the 4th International Emergency and Rescue Congress and Exhibition (INTERCON). INTERCON will be held at the CCH Congress Center Hamburg in Germany from 13 to 15 September 2007, with expected attendance of more than 1,000 participants.

The SEPCON is capable of separating any oil/water mixtures or oil-contaminated waste waters by purely mechanical methods, using a direct flow-through method – i.e. without the need for a long dwell time in the system, and without the addition of chemicals. It makes use of a number of physical effects, such as gravitation. The system can be operated at a water temperature of 0°C to 30°C and an air temperature of -5°C to 40°C. With a mean oil/water throughput rate of 40m³/h, the SEPCON achieves separation levels of 99.999% output water purity according to DIN 1999, Part 3.

New strategies in combating oil spillages are among the key issues at the 4th INTERCON in Hamburg. Other critical issues on the agenda include current developments in disaster management, following the terrorist attacks in London, challenges from flood risks, and new experience in risk analysis for large events, particularly in the light of experience gathered at the Football World Cup 2006. Experts from academia and research, from disaster protection services, fire brigades, rescue and health services, and from politics, business and public administration will discuss new insights in disaster protection and emergency medicine, and develop joint strategies for better response to the challenges of the future. The 1st International Conference on Pastoral Care and Crisis Intervention will be held concurrently.

Further conference information and the complete conference programme are available at the website:
www.internationaler-kongress.de

Southcombe Brothers – from tradition to innovation

Building on their unique blend of expertise, experience and market knowledge, Southcombe Brothers Ltd goes from strength to strength in the technical glove market.



Fire gloves from Southcombe Brothers are made from PYROHIDE® – a soft, buttery leather that gives complete protection against fire, acids, alkalis and water. This revolutionary leather, together with top-end design and construction, means that Southcombe Brothers have become major players in the international protective glove market.

From humble beginnings in the 1840's to the forefront of technical glove construction today, Southcombe Brothers has remained true to its local West Country roots. A family-run business, managing director David Southcombe is the 5th generation of Southcombes to take the helm. Despite the slow decline of British manufacturing, Southcombe Brothers still manages to employ many local people in its Somerset tannery, machine rooms and warehouse. "We started making gloves for the fire services in 1996, at the launch of the EN659 standard," says David Southcombe. "Since then we have worked hand-in-hand with the fire service, military and police to develop and perfect our glove ranges."

But it was the invention and development of PYROHIDE® fire-resistant leather that brought their fire gloves firmly into the twenty-first century. The combination of PYROHIDE® and premium, high-end materials such as Kevlar®, Nomex® and Crosstech® membranes meant that the gloves were snapped up. Southcombe Brothers now supply 40 of the 60 brigades in the UK with their structural fire-fighting glove. "In each case, every fire-fighter who used these gloves, loved them," says Ian Moses, PPE Manager, Grampian Fire Brigade. "The glove fitted beautifully, the quality was excellent, they were able to handle equipment with ease, keep the glove clean without the leather drying out and getting stiff and more importantly, the protection offered was superb. And because of the quality of materials used in the Firemaster Ultra®, the whole life cost of the glove has been extended. We ended up buying the Firemaster Ultra® NFPA compliant structural fire-fighting glove, which we would deem to be the best glove currently available in the world today."

PYROHIDE® was invented while Southcombe

Brothers were developing gloves to extremely high standards for the British Military. Most water-resistant leathers have a coating painted on, which gives a waxy, stiff finish and can also disguise poor quality leather. PYROHIDE® has the technology added at the tanning stage which ensures the leather stays in its most natural state. It is the first and best quality leather, soft and buttery, but with amazing protective qualities. "Having our own tannery means that we have complete control over the quality of our leather from raw material to end product," says David Southcombe. "It means that we can integrate the technology into the leather itself rather than simply coating the end product. PYROHIDE® is an aniline leather in its most natural state, and therefore, unlike coated leather stays tactile and dextrous. I remember when I first saw our tannery manager testing the leather with concentrated sulphuric acid. The droplet sat on the surface of our PYROHIDE® and didn't even make a mark! We knew then that we had developed something extremely exciting."

Travelling abroad and exhibiting at major shows abroad has led to Southcombe Brothers positive international profile. Working with international clients has become a major part of their business and one that Jason Dutfield, their recently appointed sales manager, has plenty of experience in. "Exhibiting at shows in America and the Middle East has been invaluable in widening our client base," said Jason. "Nothing beats that face-to-face contact for securing orders!" Southcombe Brothers will be exhibiting at Fire Rescue International, Atlanta, USA in August and are also looking forward to FDIC Bahrain at the beginning of December.

At this exciting time in the protective glove market, Southcombe Brothers are leading the way.

IFF

See more about PYROHIDE®, the FireMaster range of fire gloves and other technical glove developments at www.southcombe.com



Accidents do happen

Wherever there is a hazard, such as chemicals, toxic substances, solvents or dust, there is a risk of an accident, no matter how strictly a company adheres to stringent health & safety measures.

Emergency de-contamination units such as showers, eye or face washes, are there for the accidents that employers hope will never happen. What looks to be a low risk environment can give rise to the unexpected – whether by something unpredictable such as a dust or substance explosion, or by a lack of care and attention to safety by staff.

The first few minutes immediately after an accident can be vital for reducing the level of injury. Any contaminants in the eyes or on the skin require swift and immediate removal, and being able to take a skin or face wash straight to the victim, rather than waiting for an ambulance to arrive, is critical.

Today's emergency decontamination solutions come in various forms, and there is actually no excuse for being unable to source the right solution.

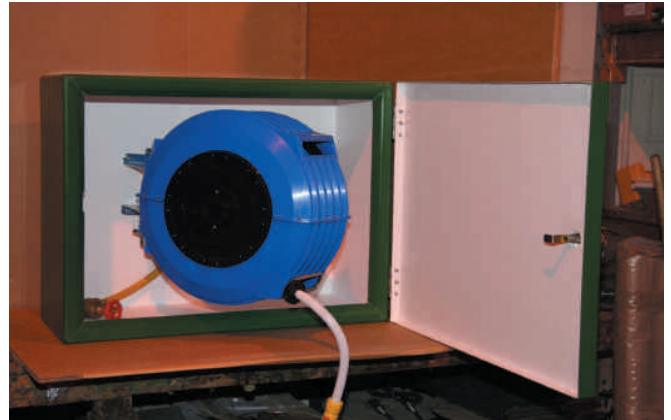
Allen Yates, director of SHOWERS & EYEBATHS SERVICES LTD, explains:



Allen Yates

"There are all sorts of considerations you need to take into account when choosing the right decontamination solution for your business. It doesn't have to be expensive, since much of the equipment needed can be portable, moved quickly from one area of the workplace to another, and is designed to be extremely low maintenance. It's worth taking the time to get the right unit for the task.

"If you have a working environment where there is a possibility of getting



covered with a substantial amount of contaminant, then you will need a shower facility. However, where the spillage is likely to be small, you would probably just need a smaller solution for washing out eyes or a small patch of skin.

"Having easy, fast access to an eye wash can be a problem if the environment in which you are in does not allow for a permanent, plumbed in piece of kit. For this, a facility such as the E250 self-contained Portable Eye & Face wash, which can be quickly and easily carried into action as soon as required, should be considered. The 18 litre cylinder of stainless steel has a trigger operation with dust cover, and 1.5 metre flexible stainless steel hose allowing contaminants to be rinsed from any body part. Alternatively, a trolley version with twin cylinders (Model GPW3) is available, in which the waste water is collected in the underneath of the unit and easily disposed of.





"A portable shower, for example the GPSS3, can take just 60 seconds to be ready for use and fold down to the size of a small case. Storage of the shower in small workplaces becomes easy and cost effective. However, when you choose your shower unit, think practically. If you have a free standing shower facility that dumps a whole load of water straight onto a floor where others are working, you could end up with more injuries. A unit that can contain the water would therefore be necessary.

"It may be critical in certain workplaces that the ground or surface can be rinsed quickly. A retractable hose reel (model CW100) will enable you to wash either the victim or the ground, or even both. Lightweight, and with a fully automatic rewind, the hose reel is easy to install and virtually maintenance free. We also manufacture a cabinet with heater to protect the hose reel from freezing if installed outside."

As a guide, here are a few points to consider when weighing up what facility, or facilities, you may need:

- Identify the hazard and the seriousness of the risk
- Will you need a shower facility or just an eye wash?
- What is the size of the workplace, and how many workers are employed?
- Do people tend to move around a lot? If so, portability will be important.
- Can the water drain into the ground or will it need to be contained?
- Will the water supply be uninterrupted or intermittent? This is an important consideration to determine the most suitable type of shower.
- What are the physical constraints i.e. how much space do you have on which to attach or store a unit, and could it be obstructed at any time?



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Recent difficulties in the Russian coal mining industry



By J. C. Jones

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This piece is being written on 24th May 2007, when the BBC News web site records that at a coal mine in Siberia there has been an explosion claiming over 70 lives. Such accidents are happening by the month in that part of the world as they are in China. Discussions of such accidents on the Chinese scene were made in a fairly recent contribution to this journal.¹ The present article will examine briefly the background to the Russian coal industry and identify factors which have led not only to poor safety standards but also to extreme social difficulties in mining communities.

Russia has in excess of 157 billion tonne of recoverable coal. Her current annual production is about 260 million tonne, about equivalent to that of Australia but well behind that produced annually by China, by India or by the USA. A low production rate does not necessarily signify that anything is amiss. In the UK, which once produced almost as much coal per annum as the US, annual output is now only about 35 million tonne per year. This followed a reasoned decision to cut back heavily on coal production in the 1980s and consequent closure of many mines (some of which are now being evaluated for their coal bed methane potential).

In pre-Perestroika Russia miners were highly paid and a miner could expect to earn more than a qualified school teacher. That gave the Russian coal miners under the former regime a certain sense of privilege which alas their descendants in the 21st Century do not share. The current situation is that Russia positively needs energy from coal, and to that end received a loan from the World Bank in 1996 to modernise her coal mining industry. There is evidence that the money so made available has not been used to full advantage and even that some of it was not spent on the mining industry at all but was misappropriated.

Even more serious are accounts one reads of employment conditions in the Russian coal mining industry, for example wages in arrears for three years. In Siberian coal mining towns miners' families often have to live in shacks believed to have been built during the Stalin era. Most such shacks have an associated vegetable plot and very often it is only the produce from these, especially

potatoes, which have enabled miners and their families not to succumb totally through lack of food. Non-payment of miners' wages has had knock-on effects on shops and small businesses which have had to close down. Over the last few years hundreds of thousands of Russian miners have lost their jobs. The unions are badly organised and there is little confidence in them amongst the miners.

Even more serious are accounts one reads of employment conditions in the Russian coal mining industry, for example wages in arrears for three years.

As was the case with miners in those parts of the US where 'company towns' once operated, the life of a miner in present-day Russia is often a pitiful one in which exploitation adds to the inherent dangers and unattractiveness of the work. The same could be said of China, a major producer of coal as already noted. The catalogue of serious accidents in the coal mines of China in recent years has aroused indignation internationally. Yet China, like Russia, badly needs energy for development. **IFF**

Reference

1. Jones, J. C., 'China coal mine fires', *International Fire Fighter*, November 2005, p. 30.



Crown Plaza, Hanover, 29th-31st May 2007



*The New Talisman
K1000 Elite*

ISG Thermal Systems one of the world's leading thermal imaging camera manufacturers gathered with their dealers in Hanover for the anticipated launch of their revolutionary new camera The Talisman K-1000. The programme for the next three days was to focus on the benefits that the new camera has over others as well as hands on live demonstrations. ISG's senior sales manager Dave Pointer and International Training Manager Tonny Hutting explained to International Fire Fighter how this camera is going to revolutionise the Tic market.

The aim of ISG is to be able to supply high resolution cameras at a lower cost. Within 12 months the goal is to supply low resolution cameras at a much lower cost than previously quoted and within another year after, to supply high resolution units at the same cost than the previous year's low resolution units.

During the classroom sessions, David Little ISG Groups Managing Director explained that the worldwide expected market growth for thermal imaging cameras will top 200% by 2012. ISG has seen an increase of 263% in unit sales this year and that's just for the US market.

The K-1000 utilises Megapicture technology which is a system developed by ISG exclusively for their fire fighting cameras. This means that picture quality is more enhanced giving the fire fighter a better viewing image. Not only does this technology improve picture quality but it also improves "headroom" which is the highest temperature the camera can clearly image which obviously improves fire fighter safety. The K-1000 is truly a first, for example, it can successfully image ceiling temperatures up to 1000°C which up until now was unheard of.

The big secret to the Megapicture technology is

the K-1000's High resolution sensor. The sensor has 76'800 imaging pixels. Think of it if you will like a digital camera or camcorder, the more pixels, the better the image quality. Coupled to this system is the K-1000's ability for fast update rates. In a situation where there are constant heat changes in the environment, Megapicture technology scans 4,608,000 scene elements each second resulting in the user viewing not only a clearer image but also to make better and safer decisions.

The brains at ISG have really been working hard on the development of the K-1000 and another great feature about the camera is its oversized lens. Just like a normal everyday camera, the same rules apply to thermal imaging cameras, the bigger the lens the more scene elements the camera can focus on. The K-1000's Megapicture system uses the biggest lens currently available and can sense 77% more data, coupled with the fast update rates the result is spectacular image clarity. ISG certainly know their stuff. Thermal imaging cameras are the only thing they manufacture, nothing else, and have over fifteen years experience. Justifiably, ISG cameras are used by Navies, Emergency services and other armed services from all four corners of the world.

*For more information about
the ISG Talisman K-1000
contact:*

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Email: d.pointer@isgthermalsystems.co.uk
or
t.hutting@isgthermalsystems.co.uk

Tonny Hutting ISG's International training manager explains the idea behind the K-1000. "Fire fighters put themselves at risk every time they enter a building that is fully involved. They are at constant risk from ceiling collapse, the possibility of a flashover situation constantly changing temperatures and also not having the correct equipment that can give them the information they need. By assessing these problems and as a qualified fire fighter, the K-1000 is the logical choice". Unlike other units, the image does not saturate when the temperature gets too high. The K-1000 can clearly detect temperatures of 1000°C which from a fire fighters perspective, will tell him if a ceiling could possibly collapse or if a flashover situation could occur. The K-1000 is also extremely user friendly, the screen constantly displays such readings as battery power and temperature. On a full recharge which only takes about two and a half hours, you can expect the camera to function perfectly for at least five hours and from switching on, the camera is ready to use in less than five seconds it also comes complete with a hard carry case and neck strap".

The Fire & Disaster Prevention School in Heyrothsberge was the venue for the Live burn demonstrations. Being a qualified fire fighter, Tonny Hutting along with some brave and foolhardy distributors kitted up in all the gear so they could see first hand, how effective the new camera was and how it operated in real situations, they were not to be disappointed. Scenarios were rigged so that the camera would be tested to the extreme and in some cases, situations which even most fire fighters will never in their lives, experience. The ISG staff were understandably a little concerned as although rigorous testing had been done on the K-1000 without any problems, situations like this with a mass audience was always going to be the place where if anything



Enhanced picture quality with the K-1000

was going to go wrong, it would go wrong. "I should not of worried" explained Tonny Hutting, "the camera excelled itself and did everything that we had said it would do". We managed to show our distributors just how clear the images were when confronted with temperatures approaching 1000°C and the picture was crystal clear we were also able to demonstrate the unique update rates everything went according to plan.

ISG have also come up with some rather ingenious options and accessories for their new camera. One in particular is the unique Break Away Lanyard system. This offers a fire fighter breakaway capability to prevent him or herself being trapped should the camera become snagged or caught on an object. Secondly, the retractable lanyard is also available which can be attached to the camera. Should you drop the K-1000 for any reason, it wont go far and stays within easy reach. There is also the option of a vehicle mount charger. This is a rugged and secure in vehicle charger that enables storage in an apparatus or command vehicle. With a quick release system and automatic charging capability, the system is designed to ensure that the imager will be totally operational when the vehicle arrives at the scene.

The K-1000 is now widely available throughout Europe and as the technical specifications below explain, this is the future of Thermal Imaging Technology. **IFF**

Talisman K-1000 specifications include:

ELECTRONICS

Sensor Type: Vanadium Oxide Microbolometer
Resolution: 320 x 240
Spectral Response: 8-14 microns
Dynamic Range: Over 1000°C in Thousand Plus Mode
Mode switch time: 0.08 seconds
Update rate: 4,608,000 scene elements per second
Field of view: 59 degrees
Nominal start up: Under 5 seconds

TEMPERATURE MEASUREMENT

Measurement: FPA Centre Pixel Area
Measurement Range: Up to 1000°C
Resolution: +/-1°C
Repeatability: +/-1°C

PHYSICAL

Weight: Under 1.4kg
Housing: Radel-R High Heat Thermoplastic
Waterproofing: IP67 – immersion up to 1 meter
Drop test: 2 meters

POWER SOURCE

Operating time: Over 5 hours
Low battery warning: Displayed on screen
Recharge time: 2.5 hours



Comments on the Cutty Sark fire

The author released the statement below to the press on the day of the Cutty Sark fire, 21st May 2007.

The Cutty Sark was constructed of wood and of iron. There have been, at these very early stages of the fire, two suggestions of possible causes:

(a) Flammable gas containers on board

(b) 'Suspicious circumstances'

Why should there be containers of flammable gases on board? The vessel was undergoing restoration so perhaps there was welding equipment present requiring acetylene or some other suitable fuel gas.

If (b) is correct, we can be confident that arsonists would have gone for the wooden structure of the vessel. They might well have used an accelerant, to aid ignition and bring about faster burning. A common choice of accelerant is kerosene. Possibly after the fire is extinguished forensic experts will examine the debris for traces of kerosene.

Often in enclosure fires there is a rapid transition from a small localised fire to one involving the entire enclosure. This is known as flashover. Did flashover take place inside the Cutty Sark? If so that makes the 'gas container' idea less probable. It does not preclude 'suspicious circumstances'.



By J. C. Jones

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Writing this piece for IFF about three weeks later the following can be added. It soon became widely known that much of the ship's wooden structure had, at the time of the fire, been removed for preservation work and this was highly fortunate. There is concern about possible loss of the vessel's iron frame. A little history on shipping will take our discussion forward at this point.

By 1869 when the Cutty Sark was built that type of vessel – the clipper, propelled by wind and accordingly needing to be of light construction – was in decline and steam ships were starting to replace them. At that time clipper operators were competing vigorously not only with steam ships but with each other. The most important design parameter for a clipper in terms of its performance was its sail area. A clipper could under suitable wind conditions travel faster than the steam ships of that time, but reliance on the wind was being seen as adversely affecting the reliability of the clipper when compared to the steam ship which of course had no such reliance and was also more robust than the clipper having a metal structure. In about 1825 Michael Faraday developed 'cathodic protection', a means of preventing corrosion of the metal structure of a ship by use of a 'sacrificial anode'. Let it be noted that almost 200 years later Faraday's development is being widely applied to prevent corrosion of offshore oil production platforms.

Though having a wooden external structure a nineteenth-century clipper would have a metal frame, and that of the Cutty Sark was made of

wrought iron. About three years before the fire extreme concern had been expressed about the condition of the vessel's iron frame which had been found to be heavily contaminated with chloride atoms which will of course enable corrosion to continue. There is an electrochemical process for removal of the chloride ions from wrought iron or other ferrous metals. The process has in fact been applied to a WWI vessel successfully, but unlike the Cutty Sark this was constructed entirely of steel making the application straightforward. With a vessel composed of wood and iron there is the difficulty of interference from substances initially produced by microbes in the wood which diffuse into the iron. A means of overcoming this by introduction into the electrochemical process of an agent lethal to the microbes responsible was developed by workers at the University of Portsmouth although problems were expected in applying it on the scale necessary to restore the entire metal structure of the Cutty Sark. The 'way to go' had not been resolved at the time of the fire although discussions and debates were under way.

Fire investigators talk of the critical temperature of a metal structure, meaning the temperature at which it will fail in its support role. This is important in the design of offshore platforms. The critical temperature could never be a hard number, as it depends on the load being experienced. Whatever was the critical temperature for the wrought iron in the Cutty Sark in its badly degraded condition must have been exceeded during the recent fire.

IFF



The new Wolf Worklite WL-85

Powerful new Worklite shines supreme

The latest WOLF SAFETY Lamp to be launched is the ATEX Certified portable Worklite. Powered by a sealed lead acid battery providing 14 hours duration on full power, the top of the range WL-85 Worklite incorporates a cluster of 12 high power 'fitted for life' LEDs, rated at 25,000 hours, with 30° optics to produce a flood of light.

Housed within a stainless steel frame and enclosure, capable of withstanding the harshest of marine environments, this totally portable floodlamp has no trailing leads or cable. It is ideal for use in blast cleaning operations and the

confined spaces of hazardous areas. Anti-static protective replaceable covers are provided to protect the glass lens during paint spraying and blasting applications.

Potentially dangerous environments, where the Worklite should be utilized, include offshore in the oil and gas industry, on ocean-going tankers, within refining, petrochemical and processing industries, water treatment, gas distribution, transport and the emergency services.

For further information please contact the sales office. Tel: 0114 255 1051

Fax: 0114 255 7988 Email: info@wolf-safety.co.uk Website: www.wolf-safety.co.uk

Bristol Uniforms secures Firebuy's Preferred Bidder status for UK's Integrated Clothing Project

BRISTOL UNIFORMS has been selected as Firebuy's Preferred Bidder for the Integrated Clothing Project which will see the company supplying Personal Protective Equipment (PPE) and all other clothing requirements over a 15 year contract period.

The past 3 years have seen a number of the UK and Europe's leading manufacturers involved in a tendering process which has included submitting designs and prices, undergoing extensive garment performance testing and hundred's of hours of management time to reach the final stages of this procurement initiative. Firebuy's intention is to deliver strategic co-ordination of procurement projects to ensure standardisation of output specifications, co-ordination of technical services and market development for clothing as well as other equipment and vehicles.

As existing supply and service contracts with fire & rescue services across the UK expire over the coming 5 years, each will have the opportunity of procuring market leading designs of PPE from Bristol including fire coats and trousers, boots, gloves, helmets and flashoods as well as other protective equipment. In addition to this, station wear, corporate wear and ceremonial dress are also included in the contract.



Roger Startin

Commenting on the results, Roger Startin, Bristol's joint managing director said, "We are naturally delighted with the outcome which we believe will bring benefits to all stakeholders — ourselves, the UK's fire & rescue services and Firebuy. Throughout the period since the project commenced in 2003 we have worked closely with all the parties involved to ensure that the eventual outcome would create best value for the customer. We have succeeded in the face of competition from other major international players, which is particularly satisfying, and believe our success stems in no small measure from the investment we have made in product innovation and a comprehensive managed care service over the last 5 years".

Liz Barron, Chair of Firebuy, added "I would like to compliment Bristol Uniforms on the commitment they showed during the lengthy tendering period and the compelling case they made for selecting them to become our Preferred Bidder. This represents a major milestone for collaboration and is a positive example of the way that the fire service will procure its major goods and services in the future. FRAs can now be sure that the protective clothing they issue to firefighters is the best available to maximise their comfort, safety and image".

For more information about Bristol Uniforms or Bristol Care™ please contact either: Roger Startin, Bristol Uniforms Ltd on 0117 956 3101 or email roger.startin@bristoluniforms.co.uk

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Record Attendance Set at FDIC 2007:

27,500 Attendees Participate in World's Premier Fire Training Event FDIC 2008 Planning Underway

A record attendance of 27,500 firefighters from around the world attended FDIC 2007, held April 16-21 at the Indiana Convention Center in Indianapolis, making it the largest FDIC ever held in its 79-year history. Planning is currently underway for FDIC 2008, taking place April 7-12.

The world's premier fire training conference and exhibition, FDIC features a comprehensive curriculum of Hands-On Training evolutions, workshops, and 150+ classroom sessions taught by 500 instructors, plus 900 exhibiting companies featuring the latest technologies in fire apparatus, equipment and life-saving product advancements. During the six-day event, the nation's leading instructors train thousands of firefighters on life-saving techniques, ranging from live burn to collapse rescue, to leadership training and recruitment issues.

"As the demands on emergency service providers have increased in the new millennium, the fire service is the natural conduit to respond to and mitigate these events. A well-trained and equipped fire department is critical to fulfill this mission. FDIC is the premier conference for current and future leaders in the fire service to attend and receive training from top instructors in North America. The tools, personal, protective equip-

the Opening Ceremony. This award recognizes extraordinarily courageous American firefighters in remembrance of the sacrifices made by FDNY members on September 11, 2001. The Courage & Valor Award commemorates the life and career achievements of Deputy Chief Ray Downey, chief of rescue operations and 39-year veteran of the

**At FDIC, the issues
confronting all firefighters
are reviewed and examined,
with the sharing of solutions.**

Fire Department of New York, who elected to remain in the World Trade Center to save others and was killed on September 11.

"For 79 years, the leaders of America's fire service have gathered at FDIC. Coming from every type of department, every background and every rank, they all share one common bond – the knowledge that great firefighters and great fire departments are made from an unfaltering commitment to training and drills. At FDIC, they meet unencumbered by any other mission to discuss Fire, the most feared threat to Americans today. At FDIC, the issues confronting all firefighters are reviewed and examined, with the sharing of solutions," said Chief Bobby Halton ret., FDIC Education Director and Editor-in-Chief of Fire Engineering magazine.

FDIC 2008 takes place April 7-12, 2008 at the Indiana Convention Center in Indianapolis, IN. For classroom information and to register, visit www.fdic.com

IFF



**As the demands on
emergency service providers
have increased in the new
millennium, the fire service is
the natural conduit to
respond to and mitigate
these events.**

ment and apparatus displayed at the event allows attendees to observe first-hand the latest technology that enables a well-trained fire department to provide the level of service the citizens have come to expect," said Chief James Greeson of the Indianapolis Fire Department.

FDIC also features the presentation of the Ray Downey Courage & Valor Award by Mr. Robert F. Biolchini, President and CEO of PennWell, during

About PennWell

PennWell Corporation is a diversified business-to-business media and information company that provides quality content and integrated marketing solutions for the following industries: Oil and gas, electric power, water, electronics, semiconductor, contamination control, optoelectronics, fiber optics, enterprise storage, fire, emergency services and dental. Founded in 1910, PennWell publishes 75 print and online magazines and newsletters, conducts 60 conferences and exhibitions on six continents, and has an extensive offering of books, maps, web sites, research and database services. In addition to PennWell's headquarters in Tulsa, Oklahoma the company has major offices in Nashua, New Hampshire; Houston, Texas; London, England, Campbell, California; Fairlawn, New Jersey; Moscow, Russia; and Hong Kong, China.

Recent acetylene fires in the British Isles



By **J. C. Jones**

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In May 2007 at Wolsingham in north east England a van containing one or more cylinders of acetylene for use in welding exploded, with loss of life of the driver. There was also damage to nearby buildings. Acetylene is of course widely used in gas welding, where it is burnt in pure oxygen in what is known as the oxy-acetylene process. It is also used in flame cutting devices. Clearly at the Wolsingham accident acetylene had leaked from a storage cylinder, entered the interior of the van and exploded by reaction with oxygen in the atmosphere of the van which, immediately prior to the accident, the van driver was relying on for respiration.

From such information as is in the public domain certain inferences can be drawn. We are told (for example in the BBC coverage) that a boy sleeping in a house affected by the blast was covered with glass from broken windows. An idea of the severity of the explosion can be deduced from this. At whatever distance the windows were from the van, the overpressure must have been about 0.02; that is, the pressure was, for the duration of the impact of the gaseous explosion products on the windows, 2% higher than that of the atmosphere previously. Had the overpressure been 0.1 structural damage to the building itself would have resulted yet we are not told that any such damage occurred.

Was it that the acetylene leaked catastrophically from a cylinder which released its contents all at once? Or was it that a cylinder had been leaking slowly and the stage had been reached where there was sufficient in the interior of the van for

**Had the overpressure been
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there to be an explosive mixture in air? The overpressure-damage information referred to will probably enable this question to be answered fairly straightforwardly by the investigators. The cylinder was allowed time to cool to ambient temperature before being removed from the debris of the fire, and here is a point of contact with an accident

only two days later in County Tyrone, Ireland. The author's understanding of this from reports on the Web is that fire fighters had been called to a fire at a disused factory where plastic waste was alight. They observed a cylinder of acetylene which

**The previous month in
Deptford, South London there
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containing acetylene were
known to be in storage.**

was leaking its contents, which burnt as a steady flame for which, presumably, the cylinder structure acted as a burner. Once the fire had been extinguished the area was closed off and kept under observation because of the possibility of redevelopment of combustion at the cylinder. Arson is in fact suspected. *If* (note the emphasis) the acetylene cylinder was of the arsonist's doing a particularly dangerous act of arson had been committed. If the cylinder had exploded as happened at Wolsingham, the blast would have been fatal to fire fighters nearby.

So two acetylene incidents took place in one week within a couple of hundred miles of each other, one fatal the other not so but having had the potential to be. The previous month in Deptford, South London there was a major fire at a warehouse where cylinders containing acetylene were known to be in storage. There was no explosion of the cylinders, but the possibility of such explosion necessitated evacuation of many nearby buildings.

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Skedco, Inc.

Skedco was founded in 1981 by Bud and Catherine Calkin for the purpose of manufacturing the SKED stretcher. Skedco immediately targeted the Military and Fire Service as the obvious market. They very quickly found that cavers, industry and wilderness rescue teams needed the Sked too.

By 1984 Skedco produced the Oregon Spine Splint. It was necessary to create their own immobilizer as the only other one was produced by a competitor. It was added to the Sked System. Shortly after the OSS came a flotation kit. It makes the SKED float nearly vertically and will "self right" when capsized. The complete system fits into one backpack that doubles as a towing harness when it is necessary to drag the SKED in a hands free mode. Later, they developed the inflatable floats which made the system even smaller for storage and transport. The complete system was then standardized by the military but it still wasn't understood by the end users.

Because the SKED was so different than other stretchers it took Skedco a very long time to create the necessary confidence within the rescue community for them to spend their money on a SKED rather than the product they were used to using. That meant that sales were hard to make. Bud Calkin would sometimes drive as much as 1000 miles to sell just one SKED. He was willing to do it as he believed in his product and was sure that when rescuers had successes with the SKED it would generate more sales. Skedco advertised as heavily as they could afford and drove countless miles in order to win the confidence of the rescue community.

When "Operation Just Cause" occurred and the U.S military invaded Panama to capture Manuel Norriega the Army purchased a very good number of SKED systems. SKED performed very well during that operation. Lives and at least one spinal cord were saved.

The U.S. Army Rangers were the first to use the SKED to haul equipment. They would drag mortars, mortar rounds, ammunition, many other critical items and sometimes a patient faster and easier than carrying them.

Catherine Calkin was also totally dedicated to SKEDCO's success. She too worked day and night to make the company succeed. She has always been president and CEO. This became a tremendous responsibility. She is the accountant as well as president, secretary and treasurer. Even now she



works extremely long days to keep SKEDCO on an even keel.

In the early 1990's OSHA mandated that industry be able to respond and affect a confined space rescue in a very short time. SKED was the natural choice for confined spaces as it will bring victims through smaller, more confined areas than any other stretcher, even when the patient is immobilized.

The Fire Service also began using the Sked a lot more frequently. They saved lives using the SKED when no other stretcher would work.

When the Military started ordering for "Operation Desert Storm" Skedco received gigantic orders. The SKED was so successful that the U.S. Military continued purchasing in very large numbers. After 10 years of no profit Skedco started to grow. It has been in a growth mode since that time. The civilian sales are now about 40% of SKEDCO's total business. SKEDCO is one of the few companies that makes products for the Military that "save lives".

SKEDCO now produces over 200 products some of which are SKED Stretcher, Oregon Spine Splint, Sked-Evac Tripod, SKEDCO Rescue Hauler and SKEDCO Microhauler 4:1 mechanical advantage rescue pulley systems, HALF SKED, SKEDCO Window Escape Anchor, Hazmat SKED Stretcher systems and a wide array of Military rescue and emergency medical products. The company and its' employees remain dedicated to saving lives throughout the world.

Skedco wishes to thank all of those brave men and women who are risking their own safety to save others. They are truly the world's greatest treasure.

IFF



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New EH20 Escape Hood delivers instant CBRN protection for first responders

AVON RUBBER P.L.C.'s protection business has developed the first purpose designed escape hood to provide instant protection for first responders, allowing them time to evacuate from a CBRN incident. The EH20 Escape Hood, which can be donned in seconds and provides a high level of protection against chemical, biological, radiological and nuclear (CBRN) agents, was launched in Autumn 2006 and is fully CE approved.

The EH20 provides, for the first time, a practical solution to providing CBRN protection in the fire services to Drivers and Officers in Charge who are not equipped with Self-Contained Breathing Apparatus. The hood can be deployed very quickly should there be an unexpected or suspected incident and has already entered service with police forces across the UK for use by unprotected first responders. It has also been purchased by the National

Health Service for at-risk paramedics. Both the Association of Chief Police Officers (ACPO) and the Police Federation have recommended that all operational police officers in the UK should be equipped with the EH20 at times of heightened security awareness. Globally, EH20 has found application with police forces and security units in Asia, Australasia, Europe and North America for special events protection, mass transit systems and personal protection for first responders.

The hood provides a high level of respiratory, eye and face protection from principal CBRN agents for at least 20 minutes to allow sufficient time to escape from a contaminated area. No such capability was available previously in a sufficiently compact and portable package. The hood is stored in a vacuum-sealed pouch small enough to wear on a belt and, when needed, the "one-size-fits-all"

hood can be donned within 30 seconds over beards, long hair and even glasses. The EH20 requires minimal training to use and has a 10 year shelf life and no maintenance.

Made of clear polyurethane, the EH20 not only protects against all airborne CBRN threats but also protects the face from splashes of agent. The clear material has a number of advantages; it gives a non threatening appearance, aids with recognition and also allows for better visual and verbal communication. Twin low profile filters on a unique hinge system incorporate the very latest membrane technology which reduces breathing resistance and also ensures ease of donning.

Jim Naylor, Sales and Marketing Manager at Avon Protection Systems, said, "The formerly unprotected operatives in the Fire Service can now benefit from the rapid protection the EH20 provides to emergency services personnel against today's biological or chemical threats, whether they arise from accidents or terrorist activity."

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The G6w is designed according to EWOtechnology and is tested to CCC capacity.

The G6w is available from August 2007.

For more information check out www.resqtec.com

World leadership in CBRN protection

Avon Rubber p.l.c. supplies a range of advanced CBRN respiratory protection solutions through Avon Protection Systems to the world's military and police forces, as well as first responders and emergency services. Avon is an acknowledged world leader in the field of CBRN respiratory protective equipment and has been supplying respirators to the UK Ministry of Defence and other NATO allies for over 80 years and is now supplying the Joint Services General Purpose Mask to the US armed forces. Avon Rubber p.l.c. also owns Avon – ISI, which designs, develops and manufactures a range of SCBA equipment for fire and rescue and law enforcement as well as military applications, further enhancing the product offering to end users and enabling integration of RPE systems to suit varying operational requirements. Avon has manufacturing facilities in the U.K. and the United States.

For more information about the new EH20 Escape Hood and other Avon Protection Systems and Avon – ISI products please contact:

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Quick Fire Knockdown in the Modern Fire Environment:

Overpowering BTU's with Big Flows

Our communities are changing, they are growing, being redeveloped . . . at a rapid pace. It seems as if everywhere you look, new construction is all around us. As new construction flourishes, we as firefighters must make it our responsibility to look at the way this changes things for us, and also maybe reexamine the way we do things.

By Chris Martin

Regional Export Sales
Manager, Elkhart Brass
Mfg. Co., Inc.

Firefighter/Engineer,
Clay Fire Territory,
Indiana, USA

From preplanning to inspections, to emergency medical services and what we pride ourselves on best . . . fire attack. Fire Attack in this modern fire environment poses new challenges to us. Fires are burning hotter and faster, leaving us to often play catch up upon the arrival of the first crews. It is imperative to deploy the right size hoseline for the job, in the right location. More lives are probably saved by properly placed lines than any other means for us, as firefighters on the fireground. It is a fact that once the fire goes out, a lot of our problems are solved, and *things are going to get better*. Fire advancement is obviously stopped, exposures are no longer at risk, and we can more safely do our jobs. In this modern fire

environment, the quick attack, or "blitz" attack is gaining more and more popularity. The advancement of a fire can be stopped by the use of a high flow handline, or particularly, a portable monitor applied for mere seconds. Once the fire is "darkened" down, handlines can be advanced to fully extinguish the fire. The use of these easily deployable, high flow devices, such as lightweight portable monitors is one fire attack method that we will look at as we face this modern fire environment.

Similar to any good competitor, we must know our opponent. In particular we are going to focus on "new" construction styles facing our communities. Not too long ago, our buildings were built of

Pic courtesy of Elkhart Brass



unreinforced masonry, and heavy timber construction. There was no such thing as a "lightweight" roof truss style construction, and synthetics were never even considered. Today, however, "lightweight" roof truss style construction is standard, metal studs are now being used instead of wood studs, and synthetics and plastics are preferred. As firefighters, this means to us a much greater danger on the fireground. Fires are burning much hotter, and because of this, flashover and rapid fire growth should be at the front of our minds every time we arrive. We all know from "Firefighter 101" that we use water because of its excellent

ability to absorb heat (BTU's). Well, as fires are burning hotter, we are naturally going to need more water to overcome these BTU's. The following indicates what we are up against:

- 1 lb (0.46 kg) of paper when burned generates roughly 2,800 BTU's of heat
- 1 lb (0.46 kg) of wood when burned generates roughly 8,000 BTU's of heat
- 1 lb (0.46 kg) of Polymer Plastic when burned generates roughly 22,000 BTU's of heat

From 30 years ago to today, our building materials are now primarily synthetic and plastics. These materials burn almost 3 times hotter than materials in fires we were used to, leading to rapid flame spread and a high heat release rate as these higher fuel loads are consumed. In addition, plastic

**Fires are burning much hotter,
and because of this, flashover
and rapid fire growth should
be at the front of our minds
every time we arrive.**

when burned, produces 300 times more smoke per pound (0.46 kg) compared with wood. Take these numbers and consider that buildings are now equipped with better insulation, limited ventilation, and design features such as Thermo Pane windows; fighting fires becomes increasingly more dangerous than we may have every been used to.

As firefighters now thrown into this modern fire environment, we may need to look at the way we are fighting fires. Is a 95 gpm (360 lpm) combination fog nozzle really the right tool we need to knock down a fire in a new construction style building? As our buildings are changing so do our



Pic courtesy of Elkhart Brass

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tactics. One such tactic is to stop the advancement of the fire rapidly through a quick, or “blitz” attack. We just reviewed that in new building construction, fire is going to advance hotter and faster, one way to stop this is to apply a large amount of water immediately to knock down the visible fire. Remember . . . *when the fire goes out, everything gets better*. The quicker we do this, the quicker things are going to get better.

Keep in mind, depending on the size and involvement of the fire, this quick attack will only last about 15 to 30 seconds.

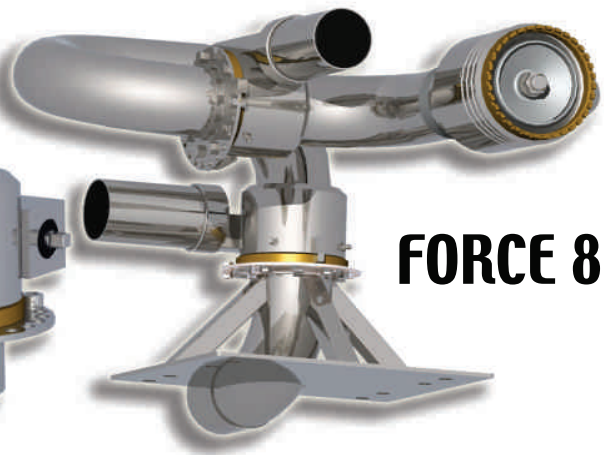
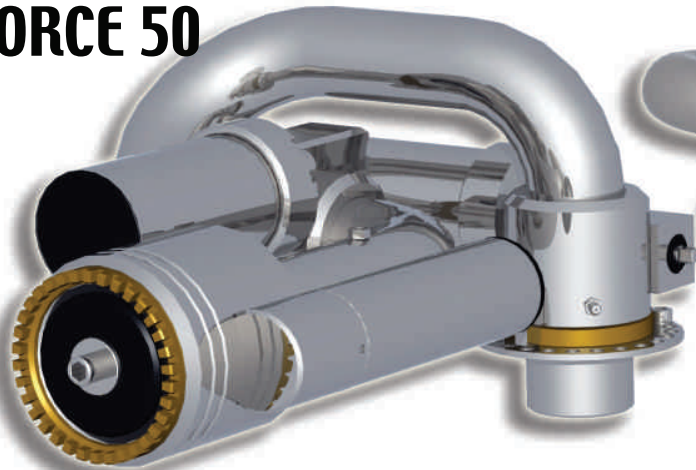
One way to achieve this quick knock down, fast, effectively, and with limited manpower is with a lightweight portable monitor. There are several models on the market, each with its own features and benefits; however the concept is fairly simple. A lightweight portable monitor is a portable monitor weighing less than 20 lb (9 kg), with the ability to deliver around 500 gpm

(1892 lpm) from one 2.5 in. (64 mm) or 3.0 in. (76 mm) hoseline. Often pre-connected, one firefighter can easily deploy this monitor and have the ability to put a lot of water on the fire . . . fast! This attack must be coordinated with other crews on the fireground, when executed properly, a large amount of the fire will be knocked down, and *things will begin to get better*. Keep in mind, depending on the size and involvement of the fire, this quick attack will only last about 15 to 30 seconds; basically until the visible fire is “darkened down”.

Once this occurs, it is then up to the crew to make entry to locate, confine, and extinguish the rest of fire. With the quick attack tactic, one is merely putting a temporary pause on the fire. It is still up to an aggressive crew to get inside and put the rest of the fire completely out. This task, however, will be significantly easier and safer as the bulk of the fire has been extinguished.

Once the quick attack has taken place, another great benefit of the lightweight portable monitor, is that it can now be used as a manifold to advance handlines from. Typically the more popular models all have a built in shutoff on the monitor. This now allows the firefighter to shut the monitor off, and attach a gated wye or reducer, and advance a handline directly from the

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monitor. This is an ideal setup for limited manpower crews, as a separate hose bundle can be kept, and used for this purpose. A “break apart” style nozzle combination is ideal to use in these hose packs. A “break apart” style nozzle refers to a nozzle combination consisting of a separate shutoff and nozzle tip. This way as the hoseline is advanced

from the lightweight portable monitor, if additional hose is needed, the shutoff can be closed, the nozzle tip removed, and an additional hose bundle can be attached to the shutoff. This can then allow for quick advancement of additional hose, without having to shut down the entire operation.

Utilizing a gated wye essentially is now what makes this lightweight portable monitor a manifold, and an additional hose line can be attached by an additional crew. Keep in mind that certain brands come equipped with a safety shutoff off in which the monitor will shutoff when moved slightly. This feature can pose a problem when the monitor is being used as a manifold, as it could accidentally shutoff if moved while advancing hose. It may be necessary to secure it in the open position, with a piece of rope or webbing, to ensure that your water supply is not compromised.

If used properly the lightweight portable monitor can be used as an effective and safer tactic as we now face the new enemy . . . the modern fire environment. If there is no threat to the occupants, why compromise the lives of the firefighters? With a quick attack, we minimize a lot of dangers that new style building construction poses. One way to achieve this is a rapid knock-down with a lightweight portable monitor, and then a much safer aggressive interior attack using the monitor as your water supply. This is just one more tactic for us to add to our playbook, and one that can help to make sure that everyone goes home. **IFF**



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The Care and Feeding of your CAFS



By Keith Klassen

As more fire departments begin to add Compressed Air Foam Systems to their arsenal of firefighting tools the need for proper maintenance of these systems becomes increasingly important. Because CAFS adds more mechanical components to the fire apparatus more items will need to be added to the daily or weekly truck check sheet. These components also must be inspected and serviced on semi-annual and annual inspections.

The easiest way to think of CAFS is as three pumping systems working together to produce foam. They are a water pump, a foam concentrate pump or proportioner, and an air pump or compressor.

We are all familiar with centrifugal fire pumps and their maintenance. These remain essentially unchanged in most CAFS. The foam concentrate and air are added on the discharge side of the fire pump. The standard fire pump works well as the water source. Some CAFS drive the air compressor off of the pump transmission however this does not affect the maintenance of the pump itself.

The purpose of the foam proportioner is to create foam solution. It does this by adding the proper amount of foam concentrate to the water to create a foam solution in the percentage required. Proportioners for CAFS are automatic

systems meaning that they automatically adjust for changes in both water pressure and flow volumes to maintain the proper proportion. Most CAFS use some form of direct injection proportioner. These systems inject the foam concentrate under pressure into the water on the discharge side of the fire pump. Direct injection proportioners are typically powered either by an electric motor or a hydraulic pump.

Most CAFS use a rotary screw air compressor to provide the air supply. Rotary screw compressors consist of two rotors which spin inside a housing. As the spin they move air and compress it on the discharge side of the compressor. The air compressor will also have an air control circuit which manages the air pressure in various operating modes. These compressors are industrial grade units designed for thousands of hours of service,



far more than the CAFS will be used. A fire department will not wear out the compressor in the CAFS but they need to be certain that it does not get damaged. Damage occurs the same way damage occurs in an engine. This is due to foreign material in the compressor, lack of lubrication, or overheating.

Along with the three pumping systems check valves are required. Check valves keep the right product in the right place. Water is one of the biggest enemies of air compressors because it is not compressible and it causes rust and corrosion. Air check valves are designed to keep water out of the air side of the system. Water check valves are used for two purposes. One is to keep foam solution out of the pump and the water supply and the other is to keep air out of the fire pump. Air in the fire pump can cause loss of prime and possible pump damage.

Gauges and flow meters may also be provided to monitor the operation of the system. A CAFS will typically have a master air pressure gauge along with the master water pressure gauge so that the pressure readings can be monitored and compared during various modes of operation. Foam solution flow volumes are usually monitored by the foam proportioner. Some smaller systems may not monitor foam solution volumes. Air flow volumes may be monitored by either manual or digital electronic air flow meters. Air flow meters are optional and are not required for system operation.

Apparatus with CAFS need a few additional items checked during the regularly scheduled truck check. These include:

- Check the level and top off the foam concentrate in the foam tank.
- Check the proportioner oil level if applicable. Typically this is done with a sight glass or a dipstick.

- Check the compressor oil level in the sight glass. Also note the color and condition of the oil. A white milky color indicates water in the oil.
- If the compressor or proportioner are hydraulically driven check the hydraulic fluid level.
- If the CAFS is powered by an auxiliary engine check all engine fluids
- Run the CAFS and flow air out of a discharge. Do this until the air coming out of the discharge feels warm. It will usually take five to ten minutes depending on ambient temperature. Wear hearing protection as this will be a noisy operation. It is important to do on a weekly basis this at minimum. The purpose is to exercise the components of the compressor air control circuit. This keeps them free and functioning properly. It is most important to do this in humid environments where moisture buildup within the system will be greater.

CAFS will also need semi annual and annual service. Semi annual service consists of checking and cleaning strainers and checking and servicing the compressor drive system.

Most systems will have two strainers. The first will be a foam strainer and the second will be a water strainer on the line to the compressor cooler.

The foam strainer will be located between the foam tank and the proportioner. It may be a wye strainer or a basket type strainer. To check and clean the strainer close the valve between the strainer and the foam tank to prevent the foam concentrate from leaking out of the tank. Disassemble the strainer and wash out any debris caught in the screen. Debris may include congealed foam due to mixed concentrates, items that have fallen into the tank, or shavings of plastic from inside the foam tank. Plastic shavings are left from the manufacturing process and will

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be caught in the strainer during the first few months of operation. After reassembling the strainer open the foam valve.

Compressors which are cooled through a heat exchanger by pump water will also have a strainer on the inlet of the cooler to prevent debris from entering and plugging the orifices within the cooler. This strainer needs to be disassembled and cleaned of any debris. There is a greater chance of this strainer becoming plugged when drafting from a dirty water source. The screen also needs

to be checked for holes. These can occur if rocks or similar debris are propelled at high velocity into the screen. This strainer will often have a quarter turn valve attached to the wye. This valve allows the strainer to be cleaned during operation. When the valve is opened water pressure will push debris caught in the screen out of through the valve.

Service of the drive system depends on the type of drive used. Typical drives include auxiliary power plants, transmission PTO, and belt drive off the pump transmission. Auxiliary power plants are



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serviced according to the engine manufacturer's recommendations. PTO drive service includes checking the driveline and u-joints. Belt drive systems require checking the condition and tension of the belt. Adjust the belt per the manufacturer's specifications.

Annual maintenance consists of:

- Change compressor oil. Different compressor manufacturers recommend various lubricants. They range from hydraulic fluid, to automatic transmission fluid, to motor oil. Check with your system manufacturer for the proper fluid.
- Replace hydraulic filter.
- Check the foam proportioner calibration and recalibrate as necessary. Check with the proportioner manufacturer for the proper calibration procedure.
- Most systems have a fixed pressure or tools mode which will allow the compressor to go to maximum pressure for air only operations. The maximum air pressure should be checked and adjusted per the manufacturers recommendations.
- Check and compare the air and water pressures in the auto balance or foam mode. They should balance within a few pounds. Check this at a static pressure. Smaller systems may have pressure variations while the systems are flowing. The manufacturer of the CAFS will have a procedure for making balance adjustments.
- CAFS also have an air/oil separator cartridge. The purpose of this unit is to recapture the oil from the compressor air before the air is sent to the discharges. It should be replaced on a biannual interval. On some systems the separator is located inside the compressor sump. Because the cartridge is not visible the technician may not realize that it needs to be serviced. Replacement requires removing the top of the sump to access the cartridge. On other systems the separator is external making replacement easier.

Be sure to check your CAFS manufacturer's recommendations for variations or additions to the checks and services mentioned in this article.

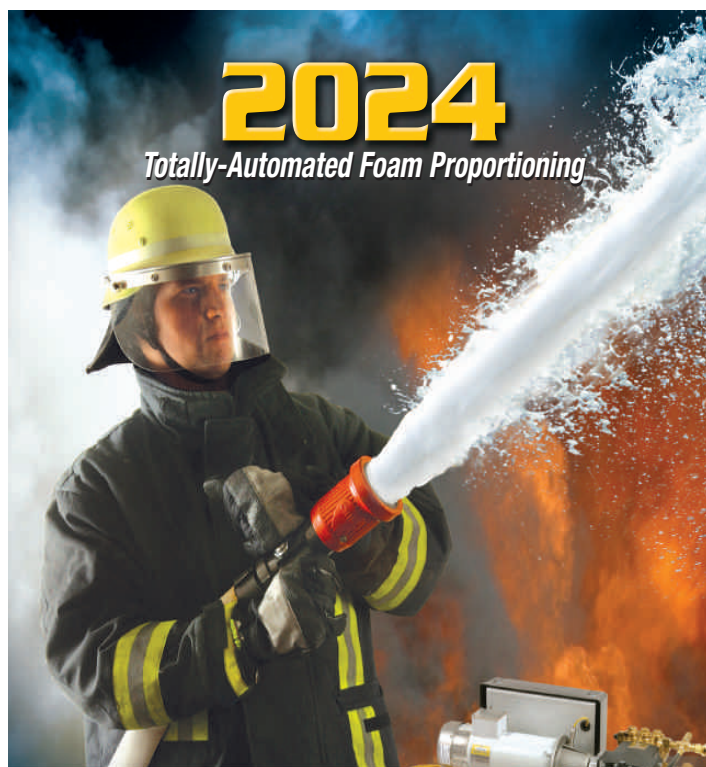
It is important that all of our equipment in the fire service works properly. We often rely on its operation in life saving situations. Its failure can also compromise firefighter safety. Proper maintenance of your CAFS will provide many years of trouble free service. CAFS is an extremely effective firefighting tool. Remember the worst thing that you can do with your CAFS is not use it. **IFF**



Keith Klassen has thirty-one years experience in the Fire Service both as a volunteer and as a career firefighter. He is currently a Captain for Summit Fire Dept in Flagstaff Arizona, USA. His experience includes both structural and wildland firefighting. He has 12 years experience using Compressed Air Foam Systems both at Summit F.D. and on numerous off district wildland assignments.

Mr. Klassen has 20 years experience as a secondary and post secondary vocational education teacher. He developed the Foam Technology in the Fire Service curriculum and teaches the class for the Arizona State Fire School and the Arizona Wildfire Academy. He has also taught for the Colorado Wildfire Academy, the California Fire Mechanics Academy, and the Arizona Fire Mechanics.

Mr. Klassen is also the CAFS Instruction Program Manager for Waterous. In that capacity he oversees all CAFS training both domestic and international for the company. He also supervises a staff of eleven training personnel. This training includes CAFS operation, repair, and system installation classes.



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Hydraulic Rescue Tools

By Jack Kusters

Extrication is one of the most preformed jobs of a fireman, and therefore the hydraulic rescue tools can be seen as an important tool. Since the first introduction of the hydraulic rescue tool in the market over 35 years ago a lot has changed. Let's look into the dynamics that define this important tool giving you an idea what to look for when purchasing.

History of the hydraulic rescue tool

Due to the increasing industrialisation of the traffic in cars, fire brigades get a new task. To free victims that were trapped in their car during a car crash, commonly referred to as extrication. The fire brigades during those days only had a handsaw, and some a motorized cutter. With a lot of moving and shaking the victim can be "helped". The vision we share today that would have been more like abuse than helping, but nothing else was available. The first ever so-called hydraulic tool used in rescue was a tool originally used for taking dents out of cars. Quickly afterwards the first hydraulic rescue tool was developed, the spreader. Seen brigades had most need for a tool that could create space, the spreader became a most widely used tool, although it was originally designed to be used only on racetracks. Seen the constructions on cars were not that tough a spreader was enough. When constructions start getting stronger there was need for a tool to cut. Seen the cutting saw was not the ideal solution the cutter was

developed. First as an attachment on the spreader, but seen that that didn't work well gave birth to the dedicated cutter as a fact. It took a while before a dedicated cutter became widely accepted as there was some resistance to giving up the spreader as the main tool. Nowadays the cutter is the most important tool on which the highest demands are placed. Its job is to cut the construction and take away parts or to weaken the construction to the point the spreader has an easy task creating room.

The last main rescue tools developed was the ram. At first there was again not much interest in the ram, as it was thought the spreader and cutter were enough. But in cases of truck accidents there is need for a tool that has capacity from the beginning onwards over a long stroke, something a spreader does not do.

Knowing something about the history let's look into the latest innovations and what drives them, learning what may be important to your department.

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Newer cars with complex constructions

It is clear that cars are getting stronger and stronger, with car manufacturers coming up with new constructions and materials. These new constructions greatly influence extrication. This simply due to the fact materials are exotic and harder, therefore making them harder to cut. The constructions create an extra influence seen the design are becoming more complex as they create a stiffer and or safer car. Nowadays these complex constructions consist of several layers of materials and are many times much larger then they used to be.

Considering this, raises the question what to keep in mind when purchasing a new cutter. Most logical one is that you must choose one that is capable of cutter the newer cars on the market. Sounds logical, but I have seen new cutter that are not able to. So capacity is a important benchmark, but keep in mind that how a manufacturer been able to use the forces is the difference between a good and bad performing cutter. Depending on what you use a cutter for you try and choose the correct one. If you need to be able to cut a car but also maybe also other materials try and go for a cutter that can cut a range of materials. Sometimes ratings like EN or NFPA can help, but my proposal is to evaluate first hand to see which tool performs. Blade design is on of those factors that play an important factor in overall performance. From personal experience I know that there are some brands that have high performing cutters largely due to there blade design. Also keep in mind that different blade design, need different ways of cutting, so when choosing a special blade training may be required to make full use of it.

If your department is mostly involved in extrications it may be good to think about a cutter dedicated for those complex car constructions. These blades are purposely designed to work optimally when cutting these constructions find in new cars. They have a large opening and have a C or even a W type design to pull the construction towards the central bold of the cutter.

Something that I find is overlooked when purchasing a cutter is if it is able to cut without, or a minimum of impact. Stabilization and the whole operation it is tried to keep the patient stable, where some cutters may be able to cut the construction but create a very big impact which is not beneficial.

Safety to the passenger and user

Safety to user and passenger are important aspects and therefore should be kept in mind in tool design. Indicators like safety factors on body, hoses can be an indication how well the tool is manufactured. Usually this related directly to the price of the tool, depending on the materials used in the tool. Choice of aluminum and anodization can greatly determine live span and reliability. A safety factor of 1.5 to 2 is common.

On hoses there is usually a safety factor of 4, or even 8 on some of the safer ones. Connectors the same. Both hoses and connectors are critical aspects of tool construction and therefore may ask some evaluation. Originally the tail hoses where standard, to allow the connectors to be able to move freely. There are cases where the hoses come out of the control handle or are connected to it. When evaluating look at the hoses and see what construction effects safety of operation. The



problem with fixed connections is that it may get stuck, where it has no room to swivel. A general aspects is checking the hoses always to see if there is wear or damage. The covering of hoses may seem like a good idea, but does not give protection when there is damage to the high pressure hose.

The question I get a lot is I regard to working pressure, high versus low pressure. Although there little differences, both have advantages and disadvantages so will not go into to much detail. In the most logical aspects, like power and weight there is no difference, and more to the manufacturer how they have designed the product. Therefore again, best is to evaluate the tools yourselves and see if there differences between manufacturers.

Handling and easy of use

Hydraulic rescue tools have always been hard to handle, caused due to weight. Although since the introduction the weight has been reduced dramatically, and hope that will continue it remains a bold task. It is a fact that the weight influences the attention of the user. The more control a user has over his tool the more control he will have over the whole scenario. In the last years manufacturers are paying more attention to the influence of weight understanding that they can be improved. Work with aspects like balance, control handle design and importance of grip to make it easier to work with the tool. Some manufacturers have put effort on this aspect by researching all factors that influence weight. When working with the tool you notice the difference.

Hoses in general influence handling and easy of use. Make sure you evaluate how hoses are connected in the way of operation, like if they stick out and are easy to swivel.

One thing that in my opinion should be standard is a flat face design connector with automatic locking. A connector that takes sand or other particles, without intensive cleaning are easy to connect. This is a major advantages that can save time! Departments are still buying connectors that can not take dirt, so evaluate this when purchasing.

Evaluation of equipment

Having discussed some of the most important aspects of tool design at this moment how do you choose the tool and brand that is right for you?

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Jack Kusters is an expert in extrication and rescue in general. With over more than 29 years as a fireman he has worked for several organisation. He started as a firemen and did the rescue job in practice. Several educations and training later he was promoted to fire chief but his love for the extrication stays. He wrote several books and articles and gives lessons all over the world. Many tool and equipment that we use now for extrication is started as a brainwave from Kusters, where manufactures have translated the idea to a useful product. Begin 90's he developed a new system for extrication for the Dutch emergency response services. Among others he was asked by the Dutch government to investigate all techniques used around the world to see if it would be possible to improve and come up with a global approach. This became known as the "Kusters" approach.

Email: j.kusters@artesis.nl
Website: www.artesis.nl

The best recommendation I can make is to see the performance first hand and invite all the major manufacturers. Allow them to explain what is unique about there tool, but don't be only bias what they say. Test them on aspect like discussed above. Especially with aspects like cutting performance you can notice the quality of a product and differences between manufacturers. Invite the different manufacturers that you think fit your profile, and set out a test procedure.

The best advise I can give in the evaluation of tools is to have clear what tasks need to be preformed, and the list of criteria you like to test the tools on.

To help in the choice of rescue equipment I am currently developing a guide to assist in the evaluation. It will be downloadable from our website, www.artesis.nl

Training and techniques

There is a common saying shared by many extrication experts, that that even the best tools can be

made to perform badly. During evaluations I sometimes hear somebody say they can break a tool. That is correct, as with incorrect use any tool will break down. Training in using the right technique does not only result in correct performing of a extrication, but also to take full potential of a tool.

Especially with cars getting stronger, it is essential to make full use of the capacity. One basic principle is to make sure when performing a cut try and place the blade as close to the central bold as possible. Forces are much high here. If the car post is to big, first squeeze the post first and then cut it.

Training is also important to make sure you stay ahead with new techniques. With new items in cars like airbags, break lines can effect an extrication greatly.

Training is vital! Some manufacturers offer training with the purchase of there tools, or go to a training school, or hire me.

If there are any questions or remarks I look forward to hearing from you.

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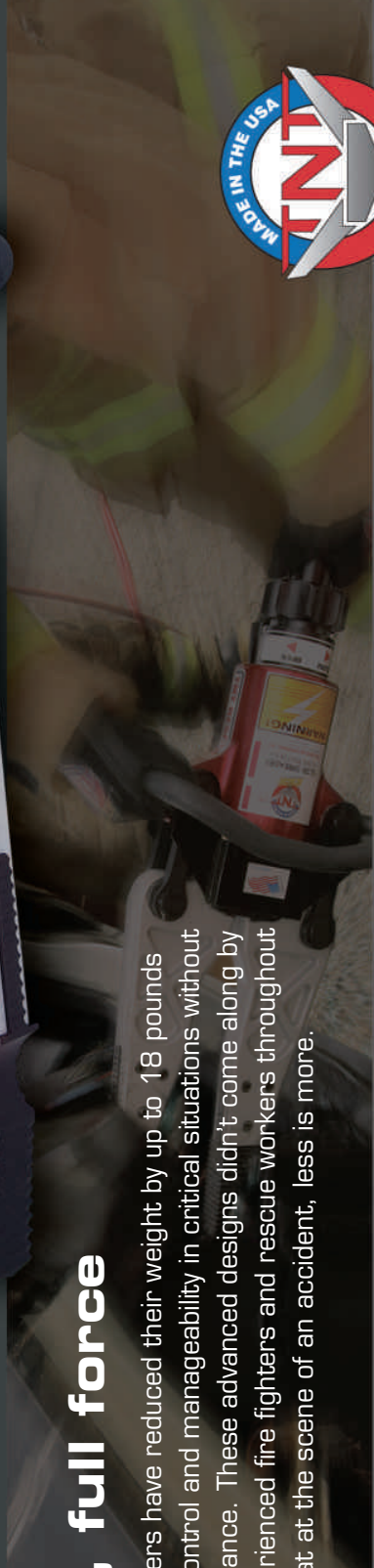
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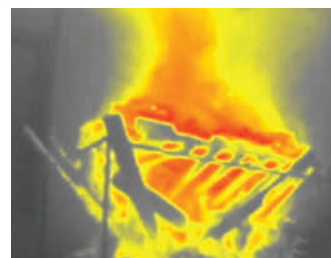
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Pic courtesy of Hytrans



High Volume Pumping, The Hytrans Pumping System

The need for a water transport system without draft problems was developed over twenty years ago; the High Volume (Submersible Pump) called the HydroSub, which basically is a hydraulic driven submersible pump which is fed via 60 meters of hydraulic hose by a diesel driven power pack. This enables the submersible pump to be hand carried to locations where it is impossible to use standard suction pumps due to the limited length of the suction lines.

By Richard Verhoef

Although developed in cooperation with the Dutch Home Office, its main task was providing fire fighting water and as such the system needed to be mobile and had to be deployed with a minimum of effort, time and personnel. Quick deployment is usually not a necessity during floods but comes in handy when lots of smaller flood planes or cellars will need to be emptied. The standard system HydroSub 150 will provide 3500 liter per minutes with a pressure of 10 bar, which means that transporting this amount of water can be done over more than 2500 meters thru a single 6 in. hose and still have enough pressure left to fill a tanker vehicle. However, the same power pack will also be able to drive a Super High Flow pump which can pump 11,000 liter per minutes with 2,5 bar. The

HFS-3000 submersible pumps impeller can easily be exchanged to increase the output to 8000 lpm at 2.1 bar. These impellers are generally fitted as standard as they also put out 3500 lpm at 9.7 bar. The HydroSub 150 pumps is the most popular unit Hytrans supplies with their high capacities and modular design it covers for many eventualities. The HydroSub 150 is transported on a platform which can be transported by any hook arm vehicle. Other options available are a HS-150 on trailer or loaded directly on a hook arm vehicle.

Derived from the HydroSub 150 Hytrans provides additional pump systems which range from 11,000 lpm @ 12 bar with the HydroSub 450, 22,000 lpm @ 12 bar with the HydroSub 900 and the AutoBoost pump, a fully automated boost pump which can increase the pressure of

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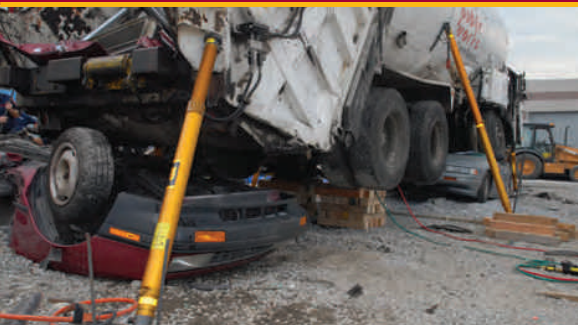
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22,000 lpm with 12 bar. Hose diameters vary from 4 in. to 12 in. The latter is mainly used for industrial fire fighting brigades. With the pumps, water transport systems can be accomplished over thousand of meters, making it possible to get water to virtually any location not in the direct vicinity of water. To recover the hose after an incident, Hytrans has developed the patented Hose Recovery Unit. The HRU can retrieve all hoses with a speed of up to 3.5 km/hour.

The latest development is a small power pack (HydroSub 60) which can power a special 'flood pump' which delivers over 15,000 liter per minute. This small power pack can be mounted on a small trailer is on the back of a small truck. The next development will be to power three flood pumps with a single HydroSub 150 unit, giving a total capacity of 45,000 liter per minute! To minimize personnel needed to operate and maintain the system, optional remote control can be installed. By using the GSM network or dedicated VHF frequencies, a single operator can monitor several pumping units from a distance. All vital parameters are monitored and alarms can come into a central command post. By using the GSM network, for example the operator can check the fuel level by simply sending a text message via his mobile phone to a unit and he will receive a text message back with the requested information.

The system has been acquired by many Fire &



Rescue Services, Governments and Industrial Fire Brigades world wide. In total, Hytrans has delivered over 300 Hose Recovery Units, more than 400 HydroSub 150's as stand alone or complete water transport systems. Numerous refineries and industrial fire brigades use big 22,000 lpm systems delivered by Hytrans. The UK Office of the Deputy Prime Minister is currently taking delivery of 50 sets under the New Dimension High Volume Pumping project and on several occasions these units have already been deployed. For instance, during floods in Carlisle and the Glastonbury festival. Further, the pumping systems are used in Belgium, Germany, Turkey, China, Japan, USA, Canada, and many more countries to full satisfaction for not only flooding but at grand scale fires as well: after the Izmir (Turkey) earthquake in 1999, several pumping units were flown in from Germany to fight the refinery fires caused by the damage. Water pumped from the sea prevented the fire from spreading and a complete disaster was prevented. This is just one of the many occasions where a system was successfully deployed for either large fires or flooding.

Flooding

The Dutch have a love-hate relationship with the water; they love the water but hate for it to flood there villages. Since most parts of Holland is under sea level an extensive protection barrier has been created to keep the Dutch dry. The biggest threat is seen to be coming from the sea, and rightfully



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so, bearing in mind the destruction the sea can bring. However, Holland is also on the receiving end of many of Europe's big rivers like the Rhine, Waal and Maas. These rivers bring water from as far away as Switzerland to Holland, and when it rains heavily in the eastern part of Western Europe, the Dutch will get a lot of water deal with. It may not come as a surprise that even the Dutch get wet feet occasionally, and as a result they have not invented wooden shoes the size of Wellington boots, but invested time and money in developing special High Volume Water Transport Systems. Preventing a flood is always the best option, but unfortunately there will always be a flood on some place where it was not expected. Flooding has a serious impact on both the economy and the environment of every country; it disrupts businesses by blocked roads, flooded offices, damaged or lost vehicles, etc. The water is often contaminated and this presents a real danger to the environment and the public health. To minimize the impact, reducing or clearing the effects of a flood is of prime importance and the right material will need to be selected to help doing this.

The problem when trying to drain a flooded plain is usually the access to the water; roads may have been damaged or become unstable, preventing big stationary pumping systems to be transported to the location by heavy trucks. Another problem is that most pumps rely on a suction lines which connects the water to the pump. Sucking water has its limits and a maximum draft of 7,5 meters is the result.

Buncefield

During the Buncefield incident, 14 High Volume Pumping sets (a set consists of one HydroSub 150, 3 Hose Boxes with in total 3000 meter of 6 in. hose and several adaptor, Y-pieces and gate valves to complete a water transport system) were deployed to provide the fire fighters with the much needed water supply. The on site fixed installed water system got severely damaged and

was rendered useless for fire fighting. The on site water basins could not be utilized to their full extend; some were inaccessible due to smoke and heat, others did not contain enough water to guarantee a water supply for long periods. A nearby rain water collecting basin off the M1 did prove a good location to take the water from, this was situated some 1.5 mile from the location. At the collecting basis it took 6 HydroSub 150 units with to pump 32,000 lpm of water. The pumps could not be placed closer to the water than 50 meters, so it took the full length of the hydraulic hose to reach the water. This location could never have been used by standard suction pump equipped vehicles.

Each pump was pumping almost 5,500 thru a twin 6 in. hose line, so in total 12 lines of 6 in. hose were deployed between the basin and the incident location. The total length of hose used was about 30 kilometer! On site, three HydroSub 150 were used as booster pumps to increase the pressure again to feed the Williams monitor and tankers.

4 each HydroSubs were also deployed on site to pump the enormous amounts of waste water as well! This problem became very clear and future incident planning on other locations should take this into account.

ODPM staff did calculate that the supply system as set up would have taken over 180 standard fire fighting appliances with at least double the amount of personnel. Now, only 9 HydroSubs were used.

Flooding UK 2007

During the recent floods in the UK, a total of 38 units were deployed to cope with the water. The UK newspapers were full of it. Hytrans dispatched an engineer to assist during the floods. Although the fire brigades in the UK are extremely well trained, there is an arrangement in place whereby, during major incidents, Hytrans will send an engineer to assist the fire brigades when operating the HVP sets.

IFF

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 - CAN-Bus driven by coloured 10,4 " TFT displays in the cab and at the pump bay
 - capacity of water and foam tank up to a total of 14.500 l
 - pump capacity up to 10.000 l at 10 bar
 - throw of roof turret 95 m with 6.000 l/min
 - throw of bumper turret 60 m with 2.200 l/min
 - dry chemical unit 250 kg
 - pneumatic light mast 4x1.000 Watt, generator driven by main engine
 - additional rescue equipment e.g. generator 13 kVA, hydr. rescue unit and PPV blower etc.
- The Z 8 meets and widely exceeds all international requirements and recommendations such as ICAO, NFPA or ADV



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*Pic courtesy of Crash
Rescue Equipment*



New ARFF Technology:

A Technical Approach To Improving the Aircraft Rescue & Fire Fighting Services Response

Airport Rescue and Fire Fighting (ARFF) services have seen many new technologies advanced in the last decade designed to improve the effectiveness of the ARFF response at civil and military airports. In a comprehensive research program, industry manufacturers assist the fire services in developing specialized equipment for airport firefighting use.

By Joseph A. Wright

President, ARFF
Technical Services, Inc.

Encouraged by standard writing organizations such as the National Fire Protection Association (NFPA) and industry regulators such as the Federal Aviation Administration (FAA), Canada Air Transport (CAT), and the International Civil Aviation Organization (ICAO), new technologies have been developed and have entered the market place.

As the pictures show, airport fire fighters can sometimes respond well before the aircraft is destroyed. Success in extinguishment is most often dependent on their training efficiency, what equipment they have, and how they maximize its use to rapidly get control of the raging fire. Re-supply or backup fire fighters are generally not there early enough to make a difference. New technology can often help narrow any gaps in first

responding fire fighting.

The following are examples of some of the more recently developed technologies to enhance the capabilities of firefighting services:

- Driver's Enhanced Vision System (DEVS)
- Global Positioning System (GPS)/Differential Global Positioning System (DGPS)
- Forward Looking Infra Red (F.L.I.R.) thermal imaging cameras
- Boom-Mounted Cabin Skin Penetration Devices
- High Capacity Bumper Turret Systems
- Dual Agent Application
- High Energy Cold Compressed Air Foam Systems (HECCAFS)
- Passive and Computer Controlled Active Stabilized Strut Suspension
- Specialized Emergency Response Vehicles

Pic courtesy of Crash Rescue Equipment



DEVS – GPS/F.L.I.R.

Quite often problems encountered by fire rescue services during actual aircraft accident responses point to the need for new technology development. Between January 1990 and February 1991, three major accidents occurred in the United States involving collisions between aircraft on active runways. All three of these accidents occurred at night and involved fatalities. The responses by ARFF services to two of these accidents were impeded by poor-visibility conditions. ARFF vehicle operators were forced to drive more slowly to avoid becoming lost or colliding with obstacles in the fog. The fog also made locating the accident sites difficult. Poor visibility and response problems were the driving catalyst to develop technologies such as DEVS and F.L.I.R. cameras.

The problem of a poor-visibility response at airports for rescue and fire fighting services can be broken down into three components:

- Locating the accident sites
- Navigating aircraft rescue and Fire Fighting vehicles to crash sites
- Negotiating terrain and obstacles in low-visibility conditions

The United States (US) Federal Aviation Administration (FAA) calls its airport poor visibility system the Driver's Enhanced Vision System (DEVS). DEVS consists of an integrated system of sensors, computers, and navigational equipment designed



Pic courtesy of Crash Rescue Equipment

to improve the response and operation of ARFF crews in low-visibility conditions. Recent operational responses have pointed to the need for airport fire services to have equipment within rescue vehicle cabs that will permit response under the limiting operating conditions of fog, rain, sleet, snow, and smoke due to environmental conditions of absolute zero fog runway visual ranges (RVR). This need can be met by a Forward Looking Infra Red (F.L.I.R.) thermal imaging camera. Crash Rescue Equipment Service, Inc. of Dallas, Texas, working with the FAA Rescue and Fire Fighting (RFF) Research and Development Program, has pioneered the use of F.L.I.R. thermal imaging cameras. F.L.I.R. BALL™ is one of the most inexpensive and yet most reliable thermal imaging cameras on the market today.

Until recently, aircraft rescue and fire services had no reliable way to locate and navigate to crash sites at airports under poor visibility conditions. A F.L.I.R. camera will facilitate faster and safer travel to emergency situations at night and in adverse weather conditions. It will also provide a substantial increase in the ability to locate people, other aircraft, vehicles, and debris at the emergency site. Its ability to see through flames, smoke, and fog in

Between January 1990 and February 1991, three major accidents occurred in the United States involving collisions between aircraft on active runways. All three of these accidents occurred at night and involved fatalities.

daytime and nighttime conditions will give ARFF vehicles a decisive increase in effectiveness in every phase of the emergency operations. A F.L.I.R. thermal imaging camera should be installed in all aircraft rescue and firefighting vehicles.

The F.L.I.R. technology is most effective when combined with a Global Positioning System (GPS) with moving map capability. The preferred DEVS would include a F.L.I.R. imaging sensor along with a differential GPS providing accuracy down to one-half meter. A fully functional system would also include a central data and command RF (radio frequency) link. These elements can be integrated into a single low-cost functional system.

Boom-mounted cabin skin penetration devices

The analysis of aircraft accidents involving external fuel fires has shown that, although external fires are effectively extinguished, secondary fires within the fuselage are difficult to control with existing equipment and procedures. In particular, there was a need to improve post-crash interior fire survivability by developing better post-crash cabin interior fire suppression techniques. Large amounts of smoke-laden, toxic gases and high temperatures in the passenger cabin can cause delays in evacuation and pose a severe safety hazard to the



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fleeing passengers. The fire fighters put themselves at great personal risk when attacking any interior fire with hand lines. Historically, there has been no proven method to get early water intervention into the cabin interior within a few minutes of arrival of firefighting crews.

There is a need to improve post-crash interior fire survivability through better cabin interior fire suppression techniques. The FAA, along with the United States Air Force (USAF) and the San Antonio, Texas, Fire Department have vigorously tested the Snozzle™. In a unique, full-scale interior fire suppression demonstration at the San Antonio International Airport, an elevated boom, with a cabin piercing device, Snozzle™ system showed the dramatic effectiveness of the cabin skin penetration and fire suppression capability. Some of the significant findings of this testing are as follows:

- The "class A" interior fire growth was successfully controlled by the Boom-Mounted Cabin Skin Penetration System with the injection of water only at the rate of 375 gallons per minute (gpm).
- Fire fighters were not required to provide additional hand line intervention from the front entrance of the aircraft; thus, the fire fighters were not put at risk when entering the burning aircraft.

Large amounts of smoke-laden, toxic gases and high temperatures in the passenger cabin can cause delays in evacuation and pose a severe safety hazard to the fleeing passengers.

- Interior temperature reductions caused by the spray of fine mist water provided a safe condition for the fire fighters to later enter the aircraft, if necessary.
- Firefighting services can use elevated boom devices with their high reach and low ground attack agent distribution to gain quicker control of post-crash external pool fires.
- Early intervention of water spray can provide a meaningful improvement in cabin post-crash interior fire survivability.

The ability to apply agent low to the ground reduces extinguishing time and, with the added cabin skin piercing device, water can be rapidly injected into the cabin of the aircraft if needed and has been proven in tests as well as operational responses.

At present, more than 400 civil airports worldwide now have elevated devices in their equipment arsenals. The 652 extended reach boom was developed to provide second level passenger seating protection for the Airbus A380 double-decked aircraft

High-capacity bumper turret systems

FAA/USAF large-pool firefighting research has shown that low ground application of extinguishing agents produces better results than the



*Pic courtesy of Crash
Rescue Equipment*

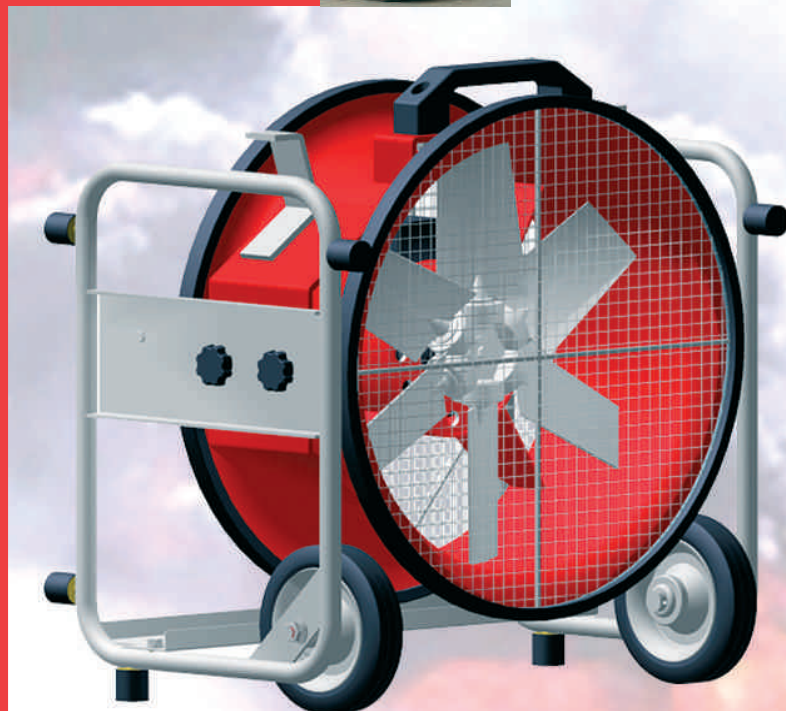
raindrop method that was used for many years in Aqueous Film Forming Foam (AFFF) applications. A more direct method for application than the traditional roof mounted turret is the high capacity extendable bumper turret. In Research and Development (R&D) testing, it resulted in a 50% reduction in agent application. The agent is

applied from a low ground position with a high-capacity bumper turret. This location eliminates agent loss or waste from high-capacity roof turret application methods.

In addition to removing the window over-spray problem, there is a significant improvement in fire knockdown and control applications when the

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agent is precisely supplied using low, parallel-to-the-ground application sweeps.

Dual-agent application

A new method has been developed to provide primary agent and secondary dry chemical applications simultaneously. Developed out of the oil well fire crises in the Middle East, the new nozzle system entrains the dry chemical powder into the master stream delivery system. This has resulted in better performance in combating three-dimensional running fuel fires. Measured results have shown the ability to deliver dry chemical precisely at distances of as much as 200 feet in USAF/FAA joint tests. Hydro-Chem™ is a considerable improvement over other dual-agent application nozzles.

nozzle design is physically limited to producing an expansion ratio of 3.5 to 1, up to about 5.0 to 1. Large air-aspirated tubes can increase the expansion ratio somewhat but sacrifice throw distance. With CAFS, the foam is created before it exits the nozzle. Air, under pressure, is injected into the water/foam stream well before it exits the nozzle. Either by injector design or by in-line mixers installed in the piping system, the water/foam and air is expanded to 10:1 or more. The air pressure adds energy to the exiting foam stream giving excellent throw distance.

Why do you want a higher expansion ratio? Water/foam as a liquid has limited ability to absorb heat. A water/foam droplet has a fixed size and as the surface area is exposed to heat, it vaporizes which in turn absorbs the heat and cools the fuel below ignition temperature. A single water droplet can make 3 to 5 bubbles in a conventional foam nozzle – thus 3 to 5 times the surface area is available to absorb heat. CAFS can produce 10 to 12 bubbles from one drop of water multiplying the surface area and the ability to absorb heat. A side benefit is that now there are many more bubbles on the fuel surface that continue to absorb heat and seal vapors. The more bubbles, the longer the drain time (time for bubbles to break down to a liquid) and the longer the foam blanket can work for you.

A water/foam droplet has a fixed size and as the surface area is exposed to heat, it vaporizes which in turn absorbs the heat and cools the fuel below ignition temperature. A single water droplet can make 3 to 5 bubbles in a conventional foam nozzle – thus 3 to 5 times the surface area is available to absorb heat.

HECCAFS

High Energy Cold Compressed Air Foam (HECCAF), and Compressed Air Foam Systems (CAFS) allow agent to be delivered at longer distances than wild fire systems. They also allow the encapsulation of high visibility PKP dry chemicals into the master stream so that it can be delivered and coat vehicles and equipment that it is sprayed on. The below pictures illustrate the latest technologies being used, and just how far the HECCAF and CAFS technology has come in the last decade. These systems are specifically designed for airport firefighting use, but have many other applications.

How is CAFS foam different from conventionally produced foam? Today's foam nozzles create foam expansion by mechanically mixing air with the water/foam solution as it leaves the nozzle. The

Stabilized strut suspension

Stabilized strut suspension by Davis Technology of Dallas, Texas is a dramatic improvement. It is no longer acceptable to consider the ARFF response as a straight-line race for acceleration and stopping. The stabilized suspension shock strut system is a passive system, and has balanced hydraulic and high-pressure air inputs. These high-pressure air inputs are controlled by a series of internal valves. Wheel deflection and control are delicately balanced to provide a precise handling package. As the vehicle traverses around a turn the shifting center of gravity is resisted by the high pressure internal fluids and provides precise correction to maintain a safe, level ride. Coupled with a computer and lateral "G" force sensors the system becomes an active system and actually leans the vehicle into the turn for safer handling at high and

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*Pic courtesy of Crash
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low speed. Although it may look like a plain shock absorber it's what is inside that makes a dynamic difference. This system is low cost and can be added to most major rescue vehicles for improved stability.

Specialized emergency response vehicles

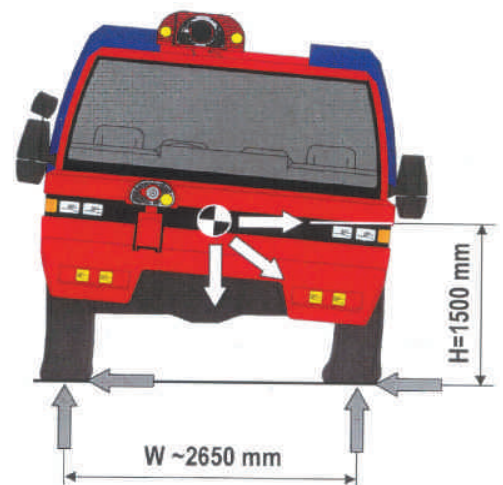
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Crash Rescue Equipment Services are the leading organization worldwide in providing new technology to military and civil aviation fire protection. Technologies which can improve adverse weather response, provide interior fire suppression, provide high performance and dynamic stability to heavy rescue vehicles, have all been developed by Crash Rescue.

In addition to research and development programs with the FAA and the USAF, Crash Rescue has its own in-house testing and Research and Development Program in Dallas, Texas. Some of the new technologies provided by Crash Rescue that will enhance efficiency and improve the firefighting capabilities of ARFF services at airports around the world are improvements to Forward Looking Infra Red (F.L.I.R.) high reach extendable turrets and agent delivery systems.

IFF



Goal: Dynamic balsaion Installation installed on an older solid axle ance is needed when traversing a vehicle suspension 30.5 M Radius turn

Joseph Wright was the Principal Airport Fire Safety Specialist and ARFF Program Research Manger for the FAA for 33 years. After retiring in 1999, he formed ARFF Technical Services, Inc. Phone/Fax 352873-3361 or ARFF TEC SRV INC@aol.com



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Do Type Approval Certificates Give The Entire Answer?

A reflection on chemical protective suits from the standards point of view



By John F. Eklund

Senior Sales and Product Manager,
Trelleborg Protective Products AB

Chemical protective suits (CPS) are available in many different designs and materials. The decision of what CPS to use must be based on type of application and desired protection factor for the actual user.

There are CPS standards that establish minimum requirements as guideline for decision makers and first responders when evaluating/selecting CPS. These standards are good tools provided that their rather complex content is understood correctly.

The most recognised standards for CPS of 'Level A' (i.e. totally encapsulated) type suits are the American NFPA 1991 and the European EN 943. The former must be considered as the superior (i.e. most stringent) of the two, as shown in the summary comparison table.

Besides the fact that the chemical permeation resistance test criteria and test duration stipulated in the American standard is more stringent compared to the European equivalent, NFPA 1991 requires abrasion of test samples prior to the chemical permeation resistance test. This requirement is regardless of the CPS being of a 'single skin/one layer reusable' or a 'disposable/limited

use' type. The EN 943 standard does not dictate any abrasion prior to the chemical resistance test.

The fact that chemical permeation tests in accordance with NFPA 1991 are made on abraded material is of great importance and advantage for the users since these results reflect the reality much better than corresponding tests made according to EN 943.

A chemical protective suit does not only represent a chemical barrier protective piece of equipment but also a working garment which will be exposed not only to contact with aggressive chemicals but to general wear and tear when operated.

Chemical resistance information based on test results made to the American standard NFPA 1991 offers greater confidence for the user since the preconditioning involves severe abrasion, reflecting wear and tear, which chemical protective suits are

STANDARDS ON GASTIGHT CHEMICAL PROTECTIVE CLOTHING

USA	Europe
STANDARD: NFPA 1991	STANDARD: EN943-1 and EN943-2
TEST CHEMICALS: 21 specified chemicals (15 liquids and 6 gases)	TEST CHEMICALS: EN943-1: ≥ 2 none specified chemicals EN943-2: 15 specified chemicals (12 liquids and 3 gases)
CHEMICAL RESISTANCE TEST METHOD: Permeation resistance test method; ASTM F739	CHEMICAL RESISTANCE TEST METHOD: Permeation resistance test method; EN374-3 or EN ISO 6529
DETECTION LIMIT OF PERMEATION TEST: 0,1 $\mu\text{g}/\text{cm}^2/\text{min}$	DETECTION LIMIT OF PERMEATION TEST: 1,0 $\mu\text{g}/\text{cm}^2/\text{min}$
PRECONDITIONING OF PRIMARY SUIT MATERIALS PRIOR TO PERMEATION TEST: Flexing and (!) abrasion	PRECONDITIONING OF PRIMARY SUIT MATERIALS PRIOR TO PERMEATION TEST: None
DURATION OF PERMEATION TEST: ≥ 60 min	DURATION OF PERMEATION TEST: EN943-1: 10 min EN943-2: 30 min (or if failure to pass include warning in users manual)
TEST TEMPERATURE OF CHEMICAL PERMEATION RESISTANCE TEST: $+27^\circ\text{C}$ ($+81^\circ\text{F}$)	TEST TEMPERATURE OF CHEMICAL RESISTANCE PERMEATION TEST: $+23^\circ\text{C}$ ($+73^\circ\text{F}$) or 20°C ($+68^\circ\text{F}$)
CHEMICAL RESISTANCE TEST OF ZIPPER/CLOSURE: Tested for penetration resistance for 60 min after 50 opening/closing cycles.	CHEMICAL RESISTANCE TEST OF ZIPPER/CLOSURE: Tested for permeation resistance for 5 min (no preconditioning i.e. opening/closing required). This test applies to EN943-2 only!
WARFARE AGENT RESISTANCE TEST: "Chembio" testing with five agents (permeation test method CRDC-SP-84010); min. test duration: 60 min., test temperature: $+32^\circ\text{C}$ ($+90^\circ\text{F}$) except for CK permeation test method ASTM F739)	WARFARE AGENT RESISTANCE TEST: No test stipulated.

exposed to during operations and training.

Do type approval certificates give the entire answer?

The answer to this question could, in fact, be "yes and no" depending how deep we are prepared to dig into the rather complex content of the standard documents and to understand the limitation of the available options of CPS.

The market offers in principle two different approaches/solutions to meet the requirements outlined in the stringent American NFPA 1991 standard:

Option one includes suits made of delicate and fragile plastic laminate based materials which are often referred to as disposable or limited use or 'Suit-in-Suit' ensembles.

These plastic laminate based suits require a second outer aluminised protective over cover to be certified according to the American NFPA 1991 standard. The second outer aluminised protective suit not only provides flame retardant resistance properties but (more importantly and unfortunately often not known) also protection from abrasion and other physical wear and tear hazards, which these delicate and fragile multi layer thin foil laminate based materials cannot stand. Consequently, this aluminised over cover (second suit) is mandatory to meet the abrasion as well as the flame retardant requirements in the NFPA standard and to be certified to the NFPA1991.

Outside the North American market this over cover (i.e. second suit) is often "forgotten" by the distributors due to price and in some cases also due to ignorance. Often, the inner barrier "plastic" suit is sold without any over cover but reference is made to type approval certificates, test protocols, resistance tables etc. which are valid for

the complete (Suit-in-Suit) ensemble only. A fact, which could jeopardise the safety of the wearer.

Furthermore, these limited use type of "plastic" suits are made of delicate and fragile plastic laminate based materials, which do not incorporate any strong base fabric but a non-woven "tissue" only offering very poor mechanical strength properties compared to the durable and reusable 'single skin – one layer' type of CPS which incorporate strong, safe and flexible true fabric.

The second option is the durable, robust and reusable 'single skin – one layer' type of CPS. These exclusive reusable 'single skin – one layer' suits meet or surpass all requirements of the NFPA 1991 standard, including the stringent abrasion and flame-retardant tests without any need of an aluminised over cover i.e. second suit. These reusable suits are made of garment materials of advanced polymeric multi layer laminates incorporating a barrier laminate and a strong, safe and flexible true base textile.

Lists of all available CPS products certified to the EN 943 by the various European notified bodies are unfortunately not available, which poses a major problem/challenge for decision makers and first responders when evaluating available certified options. Such lists of CPS products certified to NFPA 1991 exist in America and are published on the Internet. However the lists do not group or differentiate disposable or limited use (Suit-in-Suit) ensembles from reusable 'single skin – one layer' type of CPS.

Your decision and selection of CPS will not be about a piece of clothing. It will be about a life support system – your last link in your chain of protective equipment. And someone's life could depend on it.

IFF

John F. Eklund (b. 1951) is Senior Sales and Product Manager of the Trelleborg Protective Products AB, a company within the Swedish international industrial group Trelleborg AB. John is a highly qualified engineer with more than 23 years of experience in managing the development, engineering, production, marketing and sales of advanced chemical protective clothing (CPC) and other personal protective equipment (PPE).

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The Dräger FPS 7000 full face mask and the Dräger PSS 7000 compressed air breathing apparatus: Undisputable evidence that safety is more than just breathing protection.

Pic courtesy of Draeger



Taking a Modular Approach to SCBA

With more “whistles and bells” than ever before, modern day self-contained breathing apparatus (SCBA) is no longer a device that “simply” allows someone to breathe. Instead, it now plays an integral role in the safety of firefighters by offering better protection than ever before and transmitting vital data to their colleagues about real-time operational conditions as well as their own individual status. However, not every situation requires the same breathing apparatus functionality and how can something so technically advanced be designed to suit the needs of every application? The answer lies in one word, “modularity”.

By Gerd Pearson

In fact, the overall safety of professional firefighters has taken on a whole new meaning with the development of innovative modular systems that can be quickly and easily adapted to suit a particular “shout”. Placing the emphasis on usability, performance and comfort, these new systems can be linked together to meet the exact needs of today’s firefighters – as well as their needs for tomorrow.

For the first time harnesses, face masks, helmets, communications and telemetry can be selected to offer the utmost protection against specific hazards and/or exceptional circumstances. In addition, the effortless assembly and disassembly of each of the major components means that not only can the BA be configured rapidly, but easy care and maintenance will guarantee quick turnaround times in the workshop and, as a result, ensure that the breathing apparatus is always ready for use.

The start of a revolution

Back in 1990, in anticipation of the new PPE Directive, EN137, Draeger Safety seized the opportunity to develop a new type of CABA. With the standard as a guide, the company made the decision not to simply

amend existing sets but, instead, undertook extensive research to find out exactly what firefighters needed. As a result, Draeger has been able to revolutionise the design and effectiveness of BA way beyond the basic requirements and lead the way, technologically, well into the future.

For instance, the burden of weight on the back is something that every firefighter has to contend with. Following studies with the Rotterdam Fire Brigade to determine the most effective method of weight distribution and body mounting of BA sets, Draeger found that it was able to significantly reduce the likelihood of back injuries by minimising the stress on the body. In Addition, following careful consideration of a study of anthropometrics, Draeger also added a height adjustment feature to the backplate.

Recognising that BA is worn in dynamic applications where firefighters are required to move, bend and stretch, a sliding/pivoting waistbelt was introduced to ensure free movement and allow for up to 80mm of spinal stretch. Knowing that, before anything else is taken into consideration, the average firefighter is required to carry 3 kilos of

Pic courtesy of Draeger



compressed air, Draeger also took the opportunity to reduce cylinder weight. Lighter than traditional versions, carbon composite cylinders were developed and are now available in a number of different formats and configurations to suit different requirements. (In fact Draeger is still the only breathing apparatus manufacturer to make its own carbon composite cylinders.)

By the late 1990's, and still listening to its customers, Draeger launched the next phase of fully integrated CABA: electronic monitoring. This saw the introduction of the DraegerMan Bodyguard and, five years later in April 2002, the DraegerMan Bodyguard II.

Easy to use with simple push-button controls to provide fast access to essential information, Bodyguard offers a host of previously separate warning and monitoring devices within a single instrument.

For example, amongst other things, this advanced data storage unit can indicate how much air is left within the cylinder and, by calculating the current rate of consumption, will advise the firefighter how much time he or she has left. In addition, it can provide a temperature reading and act as a distress alarm if a firefighter becomes trapped. If a firefighter is unconscious and cannot move, it will, after a pre-determined time, sound an automatic alarm which is both visible and audible.

The availability of electronic monitoring also brought about the dawn of telemetry. Developed by Draeger and launched as the first system of its kind, the PSS Merlin takes the guesswork out of entry control and accountability procedures and brings a new level of monitoring and protection to firefighting applications.

Fast and accurate, it incorporates an entry control board, the DraegerMan Bodyguard and a portable radio unit attached to the firefighter's BA set. Using radio technology to continuously transmit and receive data from up to 12 individual firefighters simultaneously, this self-contained, state-of-the-art electronic system is able to remotely monitor their exact status and safety from outside the incident. Put simply, the Entry Control Officer (ECO) sees exactly what the firefighter sees in terms of Bodyguard information.

Unlike traditional manual or semi-manual systems

where the ECO knows the time of firefighter entry but can only estimate the time out, the PSS Merlin provides ECOs with a continuously updated supply of vital information. Enabling them to react immediately in an emergency, this also assists with the planning of relief teams.

Meeting the requirements of TB1/97 and JCDD40, the PSS Merlin control board is based on the standard UK control board with additional electronic displays. Fully automatic and able to support rapid deployment procedures, it provides one continuous display channel for each firefighter simultaneously, with full manual back up if required. In addition to the time that the firefighter is due out (based on time remaining), up to six parameters can be seen by pressing the information button – the brigade can choose which parameters and the order in which they are shown. Data logging is also possible for post-incident analysis.

An added bonus is that the radio acts as a complete slave to the Bodyguard which means that the firefighter can forget about it – there is no need to tune to the right channel or to press transmit or receive buttons. Repeaters can be used in circumstances where signal transmission may be impaired such as in underground tunnels.

The latest developments

Forming part of a revolutionary, complete system solution from Draeger Safety, the innovative Draeger PSS 7000 Breathing Apparatus (BA) has been developed by professionals for use in even the most hostile of environments. Modular in design, it can be easily and quickly configured to suit different operational requirements and provides seamless integration with facemasks, head protection and communications equipment.

Easily upgraded to meet future needs, the Draeger PSS 7000 is the latest development in Draeger's ongoing commitment to the provision of world class breathing apparatus and incorporates tried and tested pneumatics as well as the most advanced materials. Bringing greater confidence to users by combining the very best ergonomics with reliability, durability and safety, it also offers easy care and maintenance. In addition, the Draeger PSS 7000 combines a wide range of features to maximise comfort and minimise both stress and fatigue, and is ideal for use with personal monitoring and/or telemetry systems.

The new harness, for example, features advanced compression moulded comfortable padding that combines high temperature performance with exceptional wear resistance. A high grip, anti-slip surface ensures that the harness stays in position and the set remains secure on the body, whilst a quick release mechanism on both the waistbelt and shoulder harness allows quick and easy detachment for easy cleaning and maintenance.

Adjustable and robust, the new heavy duty stainless steel strap buckles ensure long life and easy operation when donning and doffing, and the shoulder pads and waistbelt both feature a new quick release mechanism for easy maintenance. As an added benefit, the new hose sleeves on the shoulder harness are covered with reflective material to increase visibility and, at the same time, provide additional hose protection and minimise the risk of snagging.

Featuring 3-point height adjustment, the lightweight, high strength carbon composite back plate incorporates further integral hose channels to eliminate snagging and offer improved protection.

Large carrying handles have also been integrated for better handling and safety, and a new slide and swivel waistbelt mechanism ensures correct positioning on the body during donning. The first stage pressure reducer has also been fitted with a quick release mechanism for easy maintenance.

Also designed with the needs of firefighters in mind and fully compatible with the Draeger PSS 7000 BA as well as the Draeger HPS 6200 Helmet, the new Draeger FPS 7000 Full Face Mask forms part of the same revolutionary, complete system solution from Draeger Safety. Developed as a result of user consultation and representing a new standard in terms of safety and wearer comfort, it combines the very latest ergonomic design with a large field of vision and a secure fit that feels both comfortable and natural to wear. Offering more flexibility than ever before, with a wide range of modular, integral accessories, this robust, easily maintained mask is also available in a variety of sizes.

Available with either a hypoallergenic Silicone or EPDM mask body for optimum comfort, the mask features a distortion-free polycarbonate visor and offers an exceptionally wide field of vision. An innovative design optimises the air circulation within the mask to eliminate misting and, in addition, a number of different coatings are also available to meet every eventuality.

Providing an outstanding fit to both the head and face, the ergonomic, double seal of the mask body ensures a secure, comfortable fit for all face shapes and contours. The uncomplicated 5-point head harness also allows the mask to be donned and removed both quickly and easily. In addition, and for those who prefer to use mask-helmet combinations, the new patented 2-point Draeger Q-fix connection, complete with safety button to prevent unintentional release, ensures that the Draeger FPS 7000 can be quickly connected to the Draeger HPS6200 helmet.

Obviously, effective communication is vital to any firefighter. For this reason, the mask can also be supplied with the new, integral Draeger FPS-COM communication system. This state-of-the-art, modular system can be easily adapted to suit specific needs, whether for radio communication or voice amplification.



Pic courtesy of Draeger

Maintenance is also quick and easy. In fact, the clever design of these special accessories and the simple maintenance of each of the mask parts ensure that the Draeger FPS 7000 is economical and easy to service as well as being flexible and versatile in use.

Draeger Safety manufactures a wide range of respiratory protective equipment as well as personal escape sets, chemical protection suits and both portable and fixed gas detection systems that are ideal for firefighters. Designed to absorb excess body heat and bring improved comfort to the wearer, the Draeger CVP 5220 Cooling Vest is a typical example.

Ideal for firefighters and those working in high temperature surroundings, it is also particularly suitable for use under gas-tight chemical protective suits as well as in industrial, shipping, mining and blast furnace applications. Unlike alternative cooling methods that require pre-freezing, the Draeger Cooling Vest incorporates a special Phase Change Material (PCM) throughout the garment. Able to reduce the wearers' temperature by around 4°C, it can, depending on the level of physical work and the ambient temperature, provide a cooling benefit for up to 3 hours.

Further information is available from:

Gary Turnbull

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Foam performance and Performance Foam

**Edited by
Brent Gaspard**

**Williams Fire & Hazard
Control**

Foam chemistry today is directed by very distinct goals. Foam products are manufactured for to be effective in their application on various fire types and product chemistry, for environmental protections, and with application specific factors in mind. Some very distinct business factors also affect foam design. These include the production costs, marketability, and budgetary constraints of potential client groups.

All firefighters should also be aware of the impact that laboratory testing has on foam manufacturing. Does testing produce better and better foam products? Do standardized testing criteria challenge foam chemistry – pushing foam products to excel?

Most laboratory testing criteria focus on minimum standards. Some laboratory tests will drive product consistency regarding structural characteristics such as appearance, refractive index, density or specific gravity, pH and viscosity. "By measuring the physical characteristics, we can determine if the product has changed from when it was first manufactured," says Joan Leedy/

Laboratory Manager for the independent testing laboratory DYNE Technologies. A common problem with foam concentrate is inadvertent dilution with water. Water dilution is often the reason why the refractive index, density or viscosity is below the manufacturers original specification.

"Another type of testing conducted by Dyne Technologies determines the performance characteristic of the foam concentrate. The performance is determined by mixing the concentrate at its nominal concentration and measuring such things as the expansion of the foam when dispersed through a nozzle, or the time for 25% of the foam to drain back to solution," says Leedy.



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"The difference in foam construction is based on the performance level to which the products were developed. Some foam companies do not formulate their products to put out fires. Rather, they formulate them to pass certain fire performance tests or criteria." Mitch Hubert, Chief Chemist with ANSUL.

Industrial foams – specifically AR-AFFF class foams – brought to market are tested by standard UL 162. UL 162 protocols use a controlled extinguishment environment using Heptane – a low vapor pressure fuel that is pure in chemical structure without additives such as those associated with gasoline mixtures, and other more complex hydrocarbon flammable liquids.

It is important to note that the UL 162 is a PASS or FAIL test – results of UL 162 bear no indication of **foam performance** and **efficiency**.

Regardless of performance or potency, a foam that extinguishes the test fire in 1 minute is viewed equally as a foam that extinguishes the fire in 2 or 3 minutes because they are all stamped as a passing grade foam.

From the perspective of the firefighter on the ground – as well as the corporate procurement office – key practical components of firefighting are extinguishment time and foam efficiency. These factors affect fire brigade strength and safety, potential exposure to other structures and personnel, environmental impact, and foam stores and logistics.

An important auxiliary test that sheds light on foam performance and efficiency is the API Chevron test. This test adheres to all UL 162 protocol, while also tracking many aspects of foam performance and efficiency. In addition, various other fuels are tested along with Heptane, such as high-octane gasoline, and high-octane gasoline

**Many AFFF foam products
designed for industrial fire
related emergencies involving
hydrocarbons and alcohol
based products – and given a
PASSING grade by the UL 162 –
fail to extinguish fires
during testing!**

blends, as well as Isopropanol to test foam performance when applied other common fuels present in a refinery and/or storage environment.

These API tests reveal an interesting observation. Many AFFF foam products designed for industrial fire related emergencies involving hydrocarbons and alcohol based products – and given a PASSING grade by the UL 162 – fail to extinguish fires during testing! Many other products perform very closely as they are tracked for control and extinguishment times and burnback performance during testing.

There is one exception, however . . . ThunderStorm® ATC AR-AFFF. ThunderStorm is blended as a potent performance based foam designed with gasoline and blends in mind.

ThunderStorm 1x3 performance stands out when tracked in the API test, performing 100% better than the nearest competitor – extinguishing gasoline fires in half the time, and performing three times better when tested on blended fuels!

Recent tests concerning the impact of Ethanol proliferation into our economies, and its presence in the public transportation environment, have shed further light on the strength of AR-AFFF foam such as ThunderStorm. When compared to various other foam types for effectiveness in the extinguishment of Ethanol, AR-AFFF is the only foam type that repeatedly will extinguish this polar solvent when applied properly.

With fixed systems, apparatus, and even handline applications there are options available in applying the foam in a means conducive to successful extinguishment.

The Ethanol Emergency Response Coalition (EERC) sponsored testing under the guidance and participation of the International Association of Fire Chiefs (IAFC), and the Independent Liquid Terminals Association (ILTA) with the intent to find out what foam agents would work most effectively on incidents involving ethanol fires in bulk storage, and in transportation scenarios. The testing was conducted over a two-week period, starting in February 2007, at ANSUL's Fire Technology Center, in Marinette, Wis. Using the Underwriters Laboratory 162 (UL162) Standard for Safety this test was performed as a blind test with the foam concentrates being put into sterile containers labeled A,B,C,D,E,F Foam Equipment and Liquid Concentrates. Forty-three individual tests were conducted on denatured ethanol (or E95), and E10 (gasohol) using Type II, Type III, and sprinkler applications. The following types of foams were tested in the blind test:

- Alcohol Resistant AR/AFFF
- Class A foam
- AFFF
- Emulsifying/Wetting agent
- Regular Fluoroprotein
- Alcohol resistant Film Forming Fluoroprotein AR/FFFP
 - specific manufacturers and products remained anonymous

The results indicate that AR-AFFF was the only foam agent that successfully passed the UL162 tests against both E10 and E85/95. While some of the other foams may have some degree of effectiveness, depending on the situation and their application rate, the tests confirmed that AR-AFFF will be the most effective foam for fires or spills involving ethanol-blended fuels.

These results beg a further and critical point about application. Due to the water miscibility of ethanol, plunging of foam during application is detrimental to the extinguishment efforts. In any given scenario responders must address their application methods to overcome the chemical

characteristics of the fuel. With fixed systems, apparatus, and even handline applications there are options available in applying the foam in a means conducive to successful extinguishment. One method when using nozzle applications as in personnel on the ground with handlines is to bank the foam against any structure adjacent to the fire to agitate the foam, break its velocity, and cascade the foam down onto the surface of the fuel for a gentle application.

When 3M withdrew from AFFF foam manufacturing Williams Fire & Hazard Control challenged the foam industry to build a superior AFFF foam that would be effective on both hydrocarbons and alcohols with proportioning requirements of 1% for hydrocarbons applications. The protocol developed for this evaluation process utilized the 3M foam concentrates as the benchmark. Products were tested on high-octane gasoline and had to meet or exceed the 3M Light Water ATC



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Figure 1

Comparison of Results from February 2001 & August 2001 Foam Tests Using UL162 Protocol														
93 OCTANE GASOLINE -- 3% PREMIX -- FOAM APPLICATION RATE=0.06 gpm/sq ft - TYPE III APPLICATION														
[Note: Williams F-601A (Ansul Production) Tested at 1% Premix]														
Results Listed in order of Fastest to Slowest Extinguishing Time														
Test	Concentrate	Temperature (°F)				Control (min:sec)	Extinguish (min:sec)	First Torch	Second Torch	10 sq. ft. Burnback Test		Foam Quality		Pass/Fail
		Premix	Air	Water	Fuel					Area (sq. ft.)	Notes	Exp	1/4 DT (min:sec)	
August 2001	Williams F&HC - Thunderstorm ATC F - 601A ATC 1X3 Lot W111 (Ansul Production) Tested at 1%	70	72	64	60	0:51	1:14	No Ign	No Ign	Self Ext	Flashover 13:40 to 14:04. Self-extinguishment at 15:34; transitory flashover & candle to 16:04.	4:70	3:25	Pass
15 Feb-01	National Foam - Univ Gold 1 x 3 AR AFFF Lot # 1004 1/01WC	53.6	60	51.2	76.7	1:50	2:30	No Ign	No Ign	Self Ext	Walkover 14:00 - 15:45. Self Extinguished at 15:45.	6:41	11:10	Pass
16 Feb-01	Verde Environmental, Inc. Micro-Blaze Out "Plus" Lot # 010119	54.3	64	51.2	67.4	1:43	2:33	No Ign	No Ign	Self Ext	Walkover 14:00 - 14:55. Self Extinguished at 14:55.	5:50	5:15	Pass
10 Feb-01	Ansul - Ansulite 3 x 3 Lot # LV 8014	61.3	62	56.3	83.5	2:03	2:44	No Ign	No Ign	Self Ext	Walkover 14:00 - 15:06. Self Extinguished at 15:06	6:67	9:04	Pass
12 Feb-01	Buckeye - 3% - 3% AR AFFF (BFC-33) Lot # 70003	59	51	52.6	66.2	1:52	2:46	No Ign	No Ign	Self Ext	Walkover 14:00 - 15:42. Self Extinguished at 15:42.	6:52	12:55	Pass
14 Feb-01	Angus - Tridol ATF 3 x 3 Batch # 1210/01/x	60	63	52	79	1:50	2:57	Ign*	Ign*	10 @ 17:45	Walkover 14:00 - 15:36.	5:82	8:00	Fail
13 Feb-01	*** Williams F&HC - Thunderstorm ATC F - 601/ ATC Plus F Lot # J11L	59.3	52	51.8	74	1:38	2:45	No Ign	No Ign	10 @ 16:55	1st walkover 14:00 - 14:35. 2nd walkover 15:35 - 16:30.	5:20	5:55	Fail
9 Feb-01	Chemguard - 1% /3% AR AFFF C-133 Batch # 011701A	61.4	70	54	83.8	1:53	2:49	Ign*	No Ign	10 @ 16:30	Walkover at 14:00 - continued burning until 10 sq. ft. at 16:30.	5:83	9:21	Fail
11 Feb-01	Akron - Style 950 Pyrocool FEF Lot #01-84	57.2	42	51.4	67.8	2:25	3:16	Ign* See Notes	No Ign	10 @ 15:55	Walkover 14:00 - continued burning to 10 sq. ft. at 15:55.	4:18	2:12	Fail

Notes: *** Williams Thunderstorm F-601A (Ansul Production) replaces F-601/ATC Plus F which is no longer commercially available

Feb-01 results are from Chevron testing at Buckeye Fire Equipment Company; Aug-01 tests were conducted at Ansul Fire Technology Center.

1. First torch test was conducted between 4:30 and 5:00 for all tests.

2. Second torch test was conducted between 11: and 11:50 for all tests.

3. Failing results listed in order of longest to shortest time to 10 sq ft burning

Kendall C. Crawford, PE, CSP
September 4, 2001

performance. The severity of most large-scale industrial fire related emergencies easily outstrips the minimum requirements needed to be acceptable in the eyes of a laboratory.

Over 50 separate formulations offered by seven of today's top foam manufacturers (3 companies offering 12 formulations each) were tested during this intense search for the best foam concentrate. This thorough evaluation program led to a relationship between Williams Fire & Hazard Control and ANSUL. Together, Williams and ANSUL built ThunderStorm to fulfill field performance requirements based on 25 years of some of the

**Those who make a living as
firefighters, as well as protect
the lives of firefighters around
them will want to have the
most potent blend of
foam available.**

meanest, most dangerous flammable liquid fires known to industry. The result – ThunderStorm far exceeds the performance required by UL 162. It was also formulated to pass stringent stability requirements established by Williams' own "Real World Plunge Test".

Those who make a living as firefighters, as well as protect the lives of firefighters around them will want to have the most potent blend of foam available. Greater confidence of fast knockdown, control, and extinguishment of any volatile industrial fire results in immeasurable benefits to the firefighter.

The magnitude of the increased performance of

ThunderStorm can be seen when reviewing API test results. (Figure 1) In all cases, the ThunderStorm product extinguished the UL fire more quickly than the other products and, also, consistently had longer burn back times than the other products.

ThunderStorm 1x3 presents many advantages never seen before in industrial firefighting. As stated, performance is unsurpassed results in a safer and much more effective response effort. Furthermore – and this is a key budgeting consideration – 1% concentrate allows for procurement, storage, staging, and application of merely one-third (1/3) the amount of foam product when compared to 3 x 3! These proportions must be considered when assessing foam costs and logistics.

One challenge with ThunderStorm was seen in the training environment. Once the premium grade of ThunderStorm had been used to extinguish a prop, ThunderStorm's overpowering extinguishment factor, and its extended vapor suppression times made it impossible for training centers to relight training modules quickly enough to facilitate multiple rotations through their live fire training props. The foam was too strong!

Therefore a sister product was blended for the training industry – named "T-STORM". While T-STORM maintains the knock down force of the premium grade of ThunderStorm, its chemistry is tailored to the training market and is non-flourinated. T-STORM's characteristics feature an accelerated drain time allowing for quicker turnaround for rotations on the training ground.

The difference between the foam blends is in the relative levels of each of the raw materials. These various blends have allowed ThunderStorm to address all aspects of market demands as well as budgetary considerations.

TRAINING



Pic courtesy of Texas Engineering Extension Service

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Merseyside Fire & Rescue Services Water Rescue Unit

By Paul Gibson

Flash floods, cities populated by 10,000 people under feet of water brought on by heavy rain and a low pressure weather system sweeping in from the Atlantic.

From the description it sounds like a film starring Charlton Heston or George Clooney, but it is the frightening reality that greeted firefighters in Yorkshire and the North East of England in June.

Estimates from the Government and Association of British Insurers suggest that 27,000 homes and 5,000 businesses have been hit so far and the final claims bill will reach more than £1bn.

Calls for a single body to take charge of flood responses in the UK have put the fire service under pressure to create a water incident taskforce that has standardised equipped and trained firefighters who can deal with natural disasters.

As part of this evaluation, Merseyside Fire & Rescue Service carried out an agency-wide study into the growing number of water rescue incidents staff was called to in 2005, resulting in the establishment of a water rescue unit and realised it

needed to train every firefighter in water awareness, and those who have a water risk in their station area in waterskills rescue techniques.

The concept of the International Waterskills Centre was formed in response to the increasing number of water incidents each week attended by Merseyside Fire and Rescue involving everything from pleasure craft to vehicles immersed in water with trapped passengers.

Working in partnership with VT Critical Services, Merseyside Fire and Rescue Service established the International Waterskills Centre in Mersey Dock, the first centre of its kind in the UK. The state-of-the-art facility is designed not only to meet the training needs of the modern fire and rescue



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service, but also the public sector and business community.

The centre not only trains its own integrated river rescue teams, but has grown into the world's first flood water training environment. It has the capacity to equip emergency service staff with basic, still-water rescue knowledge through to swift water technicians. It can also train the trainers particularly in advance water rescue, and has links with Federal Emergency Management Agency (FEMA) water rescue units and trainers based in Texas, USA and Europe.

The trigger event that catalysed the examination of the UK's ability to react to such events was the Carlisle floods in 2005, when three natural weather systems met in the North West of

The centre not only trains its own integrated river rescue teams, but has grown into the world's first flood water training environment.

England, causing three rivers to burst their banks and left rescue teams virtually unprepared for the level of flooding that would engulf the area.

Heavy rain fell in 36 hours, affecting many of the county's biggest towns including Keswick, Cockermouth, Kendal and Penrith, but the worst of the weather was experienced in Carlisle, flooding more than 1,700 homes and businesses.

Firefighters and emergency service workers were forced to improvise the rescue of people trapped by rising water, using whatever equipment they could find at the scene, highlighting the need for dedicated flood and water Fire and Rescue teams across the country.

In Liverpool, Paul Gibson, Group Manager of Merseyside Fire and Rescue's newly formed Water Rescue team watched the news unfold on the TV. ACFO Bill Evans contacted the CFO of Cumbria

and called the team together so they could prepare and mobilise.

"Within an hour there was a request for assistance being made by the emergency services in Carlisle, so we deployed to give whatever help we could. When we got there we were faced with the very unreal scenario of seeing a Victorian high street that was under six or seven feet of water and realised it was a major incident.

"It was completely un-nerving as the only sound you could hear was the lapping of water where there would normally be cars and people going about their everyday business. It was the first time we had experienced anything on this scale."

Over the next 48 hours the team rescued more than 150 people, helping them escape their homes with small non-powered dinghies and slide rafts in areas where coastguard rigid inflatable boats could not reach because of their large propeller-powered engines.

When we got there we were faced with the very unreal scenario of seeing a Victorian high street that was under six or seven feet of water and realised it was a major incident.

"Many of the rescues we performed involved the extraction of people from the upper floor windows of residential properties which were difficult to reach. We were obstructed by submerged cars in the roads, garden gates, fences and brick walls, making it impossible to use any form of propeller-powered boat or rigid inflatable," adds Gibson.

"Our training prepared us to a point, but it meant that the team was constantly adapting the ways in which they were working. Rescue teams from the emergency services on site informed each other on any new methods that worked as we progressed."

Technical rescue skills learned in Carlisle have evolved and become part of the training courses and daily operating procedures at the International Waterskills Centre.



MFC Survival's Rescue Sled used by the Merseyside Water Rescue Unit



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An internal strategic water working group at Merseyside constantly assesses their training needs, to the point where real-time scenarios are created in the dock from river rescues using jet skis and rigid inflatable boats (with slide rafts) to urban flood rescues and incidents involving vehicles immersed in water.

Chris Braithwaite, VT Critical Services Business Manager, said: "VT Critical Services owns and operates two fire training centres in the UK, Severn Park Fire and Rescue Training Centre near Bristol and Cardiff Gate Training and Development Centre in Wales, which it designed and built. It has developed a similar partnership with Merseyside and the International Waterskills Centre.

"VTES has worked with Merseyside Fire & Rescue since 2006 to establish training needs of firefighters and trainers at The International Waterskills Centre. Our role in the partnership incorporates the research and development of fire and rescue simulators, to the contract management of fire and rescue out-sourced training. This also includes management of the facilities of the centre along with fire training course design and development to the procurement of any fire and rescue training equipment the team may need both on a daily and annual basis."

The call to assist rescue teams in Carlisle has also resulted in the establishment of a specialist flood response team that is on constant standby and can be mobilised to anywhere in the North of England or Wales within three hours.

As International Firefighter goes to press, the Merseyside Water rescue team have been working alongside other emergency services in Humberside in a range of support roles.

Over the next two years, the partnership is plan-

ning to develop a new range of urban flood response courses, and expand a swift water rescue training centre in North Wales.

Paul Gibson said: "The service saw there was a need for an integrated Water rescue team to cope with the growing number of daily incidents requiring water rescues.

"The events in Carlisle taught emergency services that when it comes to water, the perfect set of circumstances can create very unreal rescue scenarios so we need each member of our team to be ready for anything.

"Fire and rescue services in the UK are reacting to the growing need for water safety and flood response training so they can deploy experienced and knowledgeable staff in the field. Search and rescue training techniques are evolving all the time as we learn from each incident."

The model developed by Merseyside and VT Critical Services is being assessed to investigate whether the partnership can be rolled-out to other emergency services, so that every firefighter in the UK is trained in water rescue techniques over the next five years.

With this in mind, the vision for the International Waterskills Centre is one of expansion and further innovation using a dry dock near the centre in Merseyside.

Paul Gibson adds: "The partnership we have with VT Critical Services is valued and vital as they have a long track record in Government and corporate blue chip training. This means we are able to draw on their expertise and resources and have access to the best and most up-to-date training facilities, encompassing our vision of a dedicated water training environment for the benefit of firefighters in the UK."

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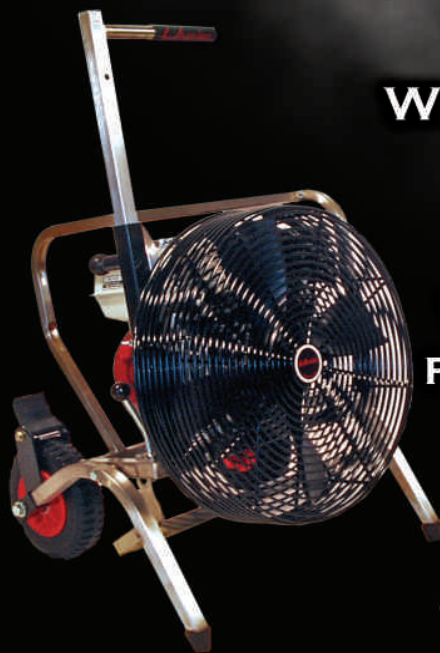
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Pic courtesy of Paul Furler



Colombian Fire Officers Breathing apparatus and Fire behaviour training in Devon

Following the training visit to Colombia in September 2006 by Peter Sandel and Paul Furler and at the invitation of the CFO, two Colombian Fire Instructors recently travelled to Devon to continue the collaboration between Devon & Somerset Fire & Rescue Service and the Colombian Fire Service.

By Paul Furler

Héctor Raúl Gonzáles Alvaran (Instructor, Official Fire-Fighters Unit, Manizales, Colombia) and Diego Moreno (Official Fire-Fighters unit, Medellin, Colombia) spent the month of May involved in a practical fact-finding mission in the County with a view to providing their own training facility in Colombia.

The aim of their visit was ultimately to gain sufficient experience as Fire Behaviour Instructors to safely deliver training in their own country, and to this end the members of staff at the Devon centre of 'training for excellence' had arranged to give them 'one to one' tuition in all aspects of the training.

The schedule for the month was an intensive one, with our colleagues taking part in an initial Breathing apparatus course alongside recruits from

Royal Berkshire, Somerset and Devon. The course would include our UK BA procedures that would be used during the training and it would be imperative that this knowledge was refreshed prior to concentrating on the Fire behaviour theory and practical drills at Devon & Somerset's Breathing apparatus & Fire Behaviour centre at Exeter Airport.

The first week followed the Initial Breathing Apparatus course; from breathing apparatus set description and familiarisation, fresh air wear, search and rescue techniques, confined space procedure leading up to a series of challenging 'cold smoke' exercises.

The week culminated in an introduction to the Fire behaviour element of Initial training in the form of a Demonstration 'Carbonaceous hot fire'

Pic courtesy of Paul Furler



container exercise.

During our September 2006 training visit to Colombia the last day of the basic BA courses included an introduction to Fire behaviour with video and photographic explanations of the signs and symptoms of Flashovers and Backdrafts, and so this first practical demonstration was extremely graphic for Héctor and Diego.

While debriefing the first week's progress it was decided that it would be advantageous for our colleagues to continue being attached to the recruit course until the Fire behaviour element had been covered in full at which time they would start their individual Instruction. Another Initial course had been scheduled for the third week and they would then be able to 'cherry pick' parts of the course to re-visit if necessary to view Instructor skills in a real training environment.

Héctor and Diego while predominantly working as a team, took part in Attack 1, 2, 3 and 4 sessions over the ensuing second week, putting the branch techniques that they had learned using our UK equipment to safely deal with fire gases in 'compartment fire' scenarios to good use.

The final exercise for the Recruit fire fighters on their initial training is a 'Hot fire' exercise in the 'Villa', incorporating all the skills that they have learned, including the search and rescue and branch technique elements.

The 'Villa' is essentially 6 containers welded together to form a two-storey building with a series of compartments inside connected by stairs and corridors. It is a multi-use facility that can be used equally well with cold smoke for search and rescue exercises.

Héctor and Diego took part in this challenging exercise and demonstrated an extremely good level of expertise.

The intention of the Authorities in the region of Manizales, Caldas is to provide one Demonstration and one Attack container based on the design used in Devon.

The site for the Centre has been allocated on the outskirts of the City adjacent to one of the Fire stations there, and it only remains for our colleagues to return with sufficient information to be able to purchase and construct suitable containers.

To further facilitate this Mr Graham Leneay the Managing Director of 'Transitional Fire' the Company who currently



Pic courtesy of Paul Furler

fabricate Devon's containers was approached and was extremely helpful in providing professional knowledge and detailed plans to enable the Colombians to start this process.

A day was spent during the second week observing the manufacturing process at the companies HQ in Ottery St Mary, Devon, where a number of completed and partially completed containers could be viewed.

Transitional Fire currently produces both Basic Demonstration and Attack containers, and also various multi-container combination units for a large number of Fire Services across the UK.

The third week of their visit involved both Officers increasingly taking the Instructor role with Devon Fire Behaviour Instructors, Nigel Snowshall and Paul Furler acting as students in a number of 'demo' and 'attack' sessions.



Pic courtesy of Paul Furler

(The 'Demo' session involves a measured quantity of fuel situated on a raised stage being allowed to develop from an initial small fire to the verge of a fully developed, well-ventilated

While debriefing the first week's progress it was decided that it would be advantageous for our colleagues to continue being attached to the recruit course until the Fire behaviour element had been covered in full at which time they would start their individual Instruction.



Pic courtesy of Paul Furler

Pic courtesy of Paul Furler



fire under the control of the Instructor. The students are able to observe the progression of the fire's development and suppression a number of times.

The Attack container has no 'staged area', but once again a measured quantity of fuel is loaded, the students are briefed and under the control of the Instructor they learn to treat the Fire Gases and progress through the compartment safely and efficiently. Increasingly as the student's progress from Attack 1 to 2 and 3, the ventilation in the compartment is reduced to demonstrate the onset of potential 'back draft' conditions.)

Both Héctor and Diego were both able to run sessions as Instructors in a safe manner but were

the first to say that they will need to refresh their Instruction technique 'in house' before they can safely train students at their new Centre in Colombia and it is envisaged that Fire behaviour Instructors from Devon will travel to Colombia in due course to assist with initial training.

A 'window container' session was also run for the benefit of both the Recruit Fire-fighters and Hector & Diego to create a series of Backdrafts.

A specially designed 6m 'window' container is loaded with a larger volume of carbonaceous fuel. The fire is allowed to develop and then suppressed by limiting the ventilation and then the process is repeated. The ventilation of the container is managed in order to build up sufficient energy for a Back draft to occur.

This demonstration is extremely valuable, as you are able to clearly recognise the signs and symptoms of an impending Back draft from a position of safety.

The final week of the visit involved consolidation of the intensive and extremely steep learning curve that our colleagues had experienced.

Both Officers returned to Colombia bursting with their usual enthusiasm and acquired knowledge and very keen to set the ball in motion in Manizales.

Thanks must go to Chief Fire Officer Paul Young of Devon & Somerset Fire & Rescue Service for his continued support to the project and to his training staff at the D&S FRS Breathing Apparatus & Fire behaviour centre under the leadership of Tam Alford.

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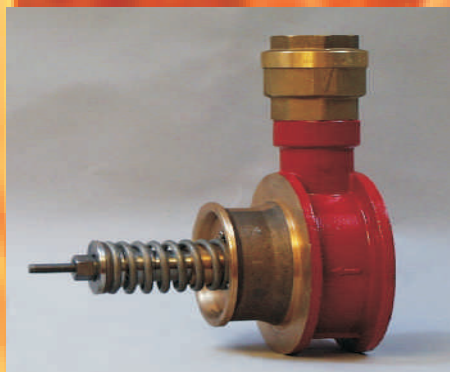


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Virtual Training:

The Realistic Option for Training of Countries

By Jack Klusters

Artesis Fire Fighting Group

Imagine!

A train station in the town centre, the train is standing still and one of the wagons is leaking. What kind of liquid is leaking out of the wagon is not clear. Passengers at the station are in panic. You can hear the sirens from the firefighters coming to the accident.

There has been a car accident on the highway. 3 passenger cars, 2 big trucks and a mini van. The van is on his side. There are bystanders screaming for help. There are multiple injured victims and there is a car on fire. There are several people who are trying to help but the fire is holding them back.

There is black smoke coming out of the window from a house in the middle of the street. A fire is burning in the kitchen. It is night, very dark and it is raining hard. It's not clear if the family is still in the house. Neighbors are standing on the street and trying to get into the house but there is too much smoke and it is too hot. On the same moment the window is breaking, the firefighters arrive on the scene.

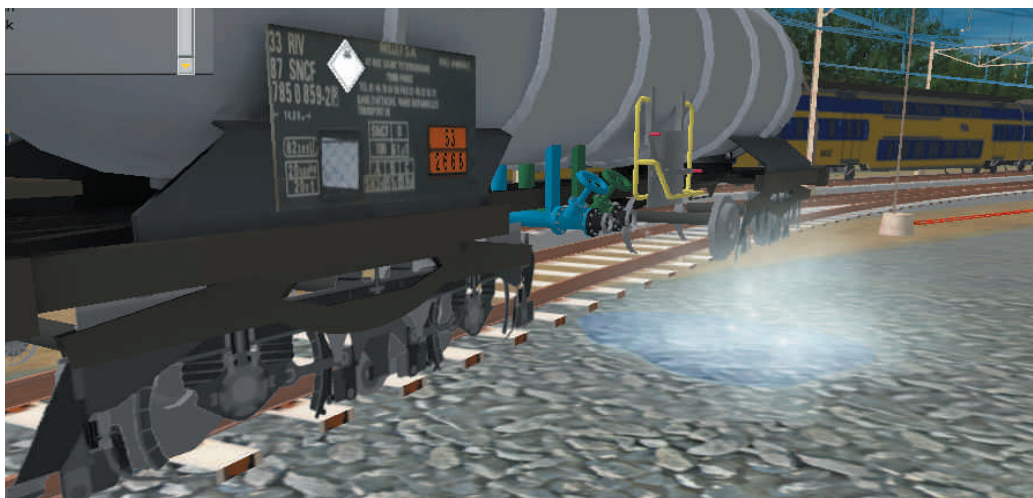
What do you do! How do you prepare and most importantly, how do you train for these scenarios or any other – as this specific scenario's or a million others can happen.

Fortunately the victims are not real, the fire is

not hot and the smoke is not toxic. These three accidents are just a small example of what is possible with the Artesis Virtual Training Program.

Especially in the Asian pacific region training is a hot topic seen that the development of the emergency organizations are growing rapidly. This growth raises the question countries are trained adequately to deal with the available equipment, and with all possible emergency scenario's that may arise. Not all countries in the Asia Pacific region are, but how do you train the large amount of people to a specific level and keep cost within proportion. With the development of virtual training programs there may be a opportunity to deal with this.

Virtual training programs offer advantages that can change the way fireman are trained and prepared for scenarios and the proper use of equipment. Virtual training can be a big step forward and offer countries and organizations, but the programs that where around so far had



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limitations making it use limited. With the new developments and new technologies, is virtual training ready for large deployment and what advantages and changes will it offer? This article describes the development and what you need to know about this revolution in training.

What is Virtual Training?

Training is a essential part to be adequately prepare for incidents with which emergency personnel will be confronted. A fire department team consists of several people with everyone a different function. So to make a team function together properly, all team members need to be trained separately, and as a group. Every team member needs to know how equipment work and be able to perform his individual part. All with the objective that ones a incident occurs the team is a well organized machine were everybody functions properly and can handle any scenario ad adequate. Basically it comes down to the fact that everybody is comfortable in what he is doing and the tools being used.

Training is the only tool that provides that objective, but unfortunately to become comfortable to handle equipment and all the different possible scenario's repetition, real live feeling and variation is necessary. Unfortunately something that physical training cannot offer, but virtual training can. Virtual training is nothing more than a digital surrounding where numerous scenarios and procedures can be created to train an individual or team to an adequate level. It is a digital representation of the physical one, but due to the fact it is digital, it offers many advantages which we will discuss in more detail.

Any training, including virtual, can be separated in a procedure or scenario based training.

- **Procedure:** the correct steps in a process for correct operation of a tool or specific operation like extrication.
- **Scenario:** a real life surrounding and incident to train a team to take correct actions during the whole incident.

Why Virtual Training?

Virtual training offers many advantages above other ways of training. Out of research it has been proven that approx 30% of training can be done virtual. Logically, this results in a huge saving in

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time and money. There is little to no need to setup trainings, which with physical training is needed. No need to put down all the necessary equipment, and no need to have the trainings objects in place, just to name a few. With virtual training ones the program is loaded it can replay itself over and over again. The main advantage therefore is that many people can be trained in a short period of time. A student can go on his own place and repeat a procedure over and over until the necessary level is achieved.

So besides that 30% can be trained virtual, more important is that physical training is done, it is much more effective, as the class or student is to a higher level and has the basic understanding. The main believe why virtual training can become

**Virtual training is nothing more
than a digital surrounding
where numerous scenarios and
procedures can be created
to train an individual or team
to an adequate level.**

a success is that training should start at the base (see a procedure), where you grown your knowledge over time. This base can be trained virtual! It is furthermore also a fact that lessons learned in a virtual training is better retained then theoretical lessons.

Besides the possible tremendous savings that can be achieved, virtual training also offers the possibility to train and exam people to a safe level or standard. Also in there own level from assistant to commander.

Working of a Virtual Training System

Like mentioned before the working virtual training program is based on procedures and scenarios. Procedures for learning the correct predefined steps and scenario's for making correct choices in a real life surrounding. This approach is based on the Dutch guidelines of training. A proven method

which the Dutch fire services use reaches its high required level and maintains it. It is a collection of individual as well as group training, both on fireman and commander level.

Procedure Training

To teach the rescue workers and to let them practice the use of for example hydraulic rescue equipment, there is a possibility to use this virtual system. With this system, the men learn how to use the tools, which preparation the tools need, how to connect them properly and how to use them on a wreckage. The big advantage of this way of working is that the procedure can be repeated till the rescue workers can work with it without making any mistakes. The Virtual System helps the rescue workers to be ready for work with real incidents. The rescue workers can practice there skills on realistic designed cars.

To safe victims from a car accident, there are some standard procedures. For example, how to take a door out or do a dash roll. These procedures are applicable for all car accidents. With the Virtual training these procedures can be practiced without the use of several car wrecks.

These procedures come out of the guidelines and are build in cooperation with leading manufactures. Students therefore truly use the equipment that looks the same as they would in real live.

Scenario Training

In the virtual training world there are several different scenes to make, so the men will have a new challenge every time they use the virtual training system. Men can build specific scenario's with existing buildings, so you can practice specific needs without having to go to the building itself. The virtual practice can be done in different levels. The experience most people who has worked with this training have is that the training is lifelike and they have the same tension as when they practice outside.

Training Commander

To train the commander and to practice, the whole team has to be on the scene, without the

opportunity to train the team.

This is not efficient or instructive for the team. With the use of the Artesis Virtual training system, the commander has the ability to practice his skills in a realistic environment without the rest of the team has to be present. The commander can practice on every suitable moment and can be done as many times he needs the practice.

The way the system is built it gives the commander the feeling that he is actually at the scene.

Possibilities with Artesis Virtual – scenarios and procedure practices

Artesis Virtual is the leading manufacturer when it comes to virtual training programs. In the last years they have developed a new system that uses cutting edge technology. Let's take a look how it works.

How does the system work?

The Artesis Virtual Computer system is a stand alone system and can be placed on every location. There has been a virtual world created in the system where there can be different scenario's build in and which can be used for training in groups or alone. Procedure training a student can do by themselves.

The system exists from a computer and two screens. One screen is for the instructor and the other screen is for the student. The instructor has a keyboard and a mouse to operate the system. The instructor can design the scene and follow the student on every move.

The student has his own screen. Every order he

gives his team, the instructor has to make this changes in the scene. The operation of the system is very simple.

Design your own scenarios

The system gives you the possibility to create your own scenario's. You can make virtual fire's on the places you want them. You can create car crashes on very different ways. You can put tank and freight cars on every location you want or cars can be places on his side. Every existing vehicle and rescue device is available to use on the screen.

Instructor's screen

The instructor can see on his own screen which actions his student is making and can help if the situation needs it.

The scenario can be adjusted during the training to make the scenes more difficult or even easier for the student. During the training all the details will be saved so it all can be discussed and evaluated after the training and it can be compared with previous scenarios.

The system is now used for the emergency services in The Netherlands is in Dutch language and typical Dutch buildings and airports are used for this. It is very easy to adjust this to any country in the world with its own language, buildings and airports.

The system can be used mono or multi disciplinary.

The instructors for this system will receive enough training to design the scenes and to help the students through the training.

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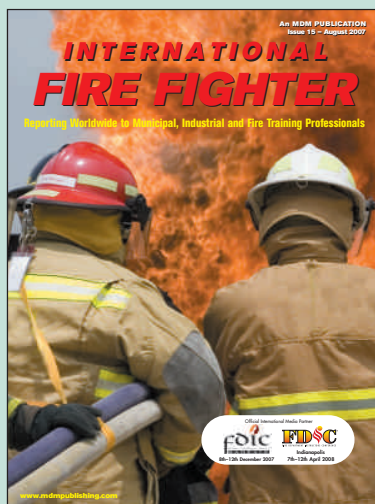
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Issue 16 – November 2007

INTERNATIONAL FIRE FIGHTER

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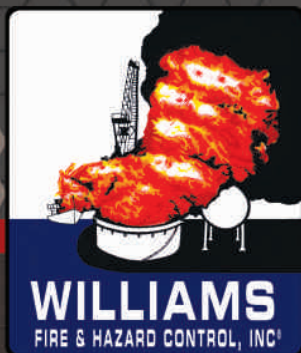


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November 2007 Issue 16



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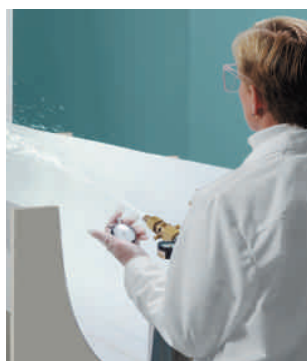
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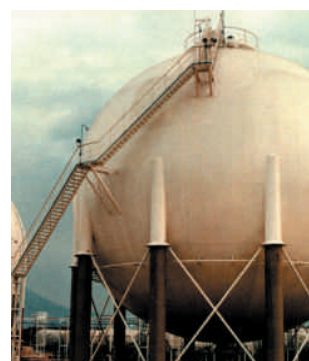
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Durham and Darlington Fire and Rescues Service Chooses Telemetry

The Durham and Darlington Fire and Rescue Service has become the latest Fire Service to choose the DRAEGER PSS Merlin telemetry system. The order, which was placed in March, 2007, was for 150 Merlin systems for use with Draeger PSS 100 compressed air breathing apparatus sets complete with Bodyguard II electronic monitoring systems.

Chris Banks, Area Manager, Organisational and People Development Directorate at the Durham and Darlington Fire and Rescue Service explains, "The PSS Merlin system will be of considerable benefit to our firefighters. The improvements we have commissioned, which include new Lung Demand Valves (LDV), Bodyguard II units and the telemetry equipment will provide state-of-the-art breathing apparatus that is not only fit for purpose and puts the Service at the forefront of modern breathing technology, but it also crucially provides a high standard of wearer safety and increased confidence. The concept of improved safety has been well received by our firefighters and roll out is eagerly awaited."

He adds, "We have used Draeger gas detection equipment for some time and have been users of Draeger BA for close to 30 years. We know that Draeger products are reliable and, following an extensive evaluation of the Merlin system, it was determined that the equipment and its support, reliability and quality were what the Service required."

"The addition of the Total Care programme means that we can be further assured that all our service and maintenance requirements will be met and that we always have a supply of spares and equipment for use as "pool stock" to ensure that we remain fully operational at all times."

Perry Jones, Sales and Marketing Director at Draeger Safety comments, "We are proud of our long association with the Durham and Darlington Fire and Rescue Service and are delighted that it has chosen the PSS Merlin. Designed to take the guesswork out of entry control and accountability procedures, this self-contained, state-of-the-art system brings a new level of monitoring and protection to firefighting applications. Fast and accurate, it incorporates an entry control board, the Draeger Bodyguard and a portable radio unit attached to the firefighter's BA set."

He continues, "Using radio technology to continuously transmit and receive data from up to 12 individual firefighters simultaneously, it is able to remotely monitor their exact status and safety from outside the incident. As a result, and



The Draeger PSS Merlin system

unlike traditional manual or semi-manual systems, the PSS Merlin provides Entry Control Officers with a continuously

updated supply of vital information, thereby enabling them to react immediately in an emergency."

Meeting the requirements of TB1/97 and JCDD40, the transponder based control board is based on the standard UK control board with additional electronic displays. Fully automatic and able to support rapid deployment procedures, it provides one continuous display channel for each firefighter simultaneously, with full manual back up if required.

Incorporating Tally Control operation, Bodyguard combines pressure indicators, temperature monitoring and distress signalling in one unit. Most importantly, this provides the wearer, (as well as the Entry Control Officer via the PSS Merlin) with an accurate calculation of remaining air time which is updated every second and is based on current air consumption.

PSS, Bodyguard and Merlin are registered trademarks.

Further information is available from Gary Turnbull, Draeger Safety UK Limited, Ullswater Close, Blyth Riverside Business Park, Blyth, Northumberland, NE24 4RG. Tel: 01670 352891. Fax: 01670 356266

Drägersafety

Fire Product Search proves to be a big hit!

FIRE PRODUCT SEARCH, the next generation of product guide, has proved a huge success since launching earlier this year. Based on actual fire products, the Fire Product Search website allows users to make an informed choice when specify fire equipment by providing up to date detailed information.

Fire Product Search features hundreds of the world's leading fire equipment manufacturers giving users a huge choice when searching for fire products. Updated constantly it provides reliable information at the click of a button.

Fire Product Search goes one step further!

Rather than list fire product categories Fire Products Search features detailed product descriptions, pictures and technical specifications plus full information on manufacturers and their distributor networks.

Still flicking through bulky buyers guides? Fire Product Search has been specially designed to make searching for



products a quick and enjoyable experience. Visitors can browse through categories, search using keywords or by company with ease. A FREE monthly e-newsletter, information on the latest global fire conferences and exhibitions plus industry news can also be found at www.fireproductsearch.com

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Haztec Launch the XSC The Ultimate LED Directional Warning Lights?!!!

Each large XSC LED Module features a total of 12 latest Generation 3 UHP LED's angled within the convex optic lens to give 180 Degree coverage producing a vivid front and side warning signal.

Although ideal for all types of Emergency Vehicles XSC is particularly good for mounting on the front sides and rear of Fire Vehicles. The advanced light gathering optics produce a superior high intensity warning signal.

The led modules are available in Blue, Red, Amber Green and White. The external polycarbonate lense in Clear, Blue, Red or Amber and the Cast Alloy Surface Mount and Bumper Housings in White or Black.

XSC are powered by a remote mount 10-40 Volt Operation Flasher Control with



switchable outputs.

The control also has Selectable Flash patterns and Steady-On Cruise Light Option at 10% of light output.

For more information contact:
Haztec International Ltd Leeds LS19 7BN

Tel: 0113 202 9115 Fax: 0113 202 9158 E
Email: Info@Haztec.biz

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HYTRANS SYSTEMS is a Dutch company manufacturing large capacity Mobile Emergency Water Supply Systems. Hytrans Fire Systems gives the industry the possibility to create up to 12" mobile hydrants over 1500 meter (or more), operational in only 30 minutes. A complete system is made up of three major parts: the HydroSub pump unit, the hose layer container and the hose recovery unit. Hytrans pumps use hydraulic driven submersible pumps, so suction loss is no longer a problem, resulting in a staggering 22,000 ltr/min @ 12 bar capacity from a single pump unit, taking water from basically any source available. The hose layer container makes it possible to lay hose with speeds of up to 40 km/hr! The hose Recovery Unit enables the crew to retrieve 1000 mtr of 6" hose in 30 minutes, rendering the complete system ready for the next emergency in minimal time. A 3500lpm water supply system over 1000 mtr can be set up with 3 persons in under 15 minutes!

Over the last couple of years, the Hytrans High Volume Pumping Systems have been deployed at some large European oil tank and refinery fires at Buncefield (UK), Münchmünster (GER), during the recent July floodings in the UK. The latest deliveries include 8 complete trucks to the Municipality of Istanbul, Turkey. An 11,000 lpm pumping unit with 2000 mtr of 10" hose to the Tallinn Harbor Authorities in Estonia, 10 complete trucks to the Malaysian Fire Fighting Organization, 4 trucks to the Bangkok Metropolitan Administration in Thailand and many more systems find their way to Fire & Rescue Services world wide. When it comes down to supplying large quantities of emergency fire water or providing flood relief on a large scale, Hytrans Fire Systems has the experience, knowledge, manpower and the right product.

For more information: www.hytransfiresystem.com

MFC Survival's flood rescue solution



MFC SURVIVAL's RS15 Rescue sled is ideally suited for use on inland waterways and as a means of transportation for people and equipment in flooded urban areas.

Following the success of the RS5 Rescue Sled, MFC Survival has added a new product to complement the MFC Survival water rescue solution which includes walkways, API stretchers, hose inflation kits, lifejackets and sleds.

MFC Survival was asked to design a craft to be towed behind a Jet ski to recover survivors from a plane forced to land on the sea within 1000 metres from the end of the runway, using a rescue crew of only 4 persons. MFC Survival's Research and Development team came up with a solution, the RS15 Rescue Sled, which can be towed singly or in tandem behind a jet ski. The sled is light weight at 50kg and can be carried by just two people. It has compact stowage attributes, measuring just 90 x 70 x 52cm when deflated and packed in its valise. The High pressure drop stitch floor creates an incredibly stable platform. It also has a raised bow allowing for better performance in waves.

The RS15 has the capability of being paddled by 2-4 persons or towed by 2 persons walking in the water. Coupled with its rapid inflation (approx 5mins using 3 x 12Ltr. 300bar air cylinders) and its operational ability to be used fully laden in only 12.5cms of water, the RS15 is ideal for flood water

rescue. It has an open low stern for ease of boarding disabled or injured persons and space for all rescued persons to sit on the floor using the tube as a backrest. The Rescue Sled can also be used for swift water rescue and as a rescue platform on ice, swamp and wetland areas where the very shallow draft is particularly advantageous.

The design of the Rescue Sled makes it simple to produce with other capacities up to 45 persons. Sleds may also be linked to increase capacity.

MFC Survival's research and development team has again proven that listening and responding to customer requirements and ideas provides a platform for continuous, new and existing product development to benefit all.

Contact:

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Sales Support and Marketing Manager

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Tel: 01443 433075

Email: marketing@mfc-survival.com



Slide to safety

In modern day work places safety is a number one priority, fire exits and escape plans are standard issue. But in a real emergency what chances do you actually stand of safely getting out? What is the best possible way to effectively evacuate the building, or maybe the only? When the stairs are not available to use, we suggest you to think different.

Two essential features of any safety equipment are reliability and ease of use. Our products are designed to be independent from other systems making them extremely reliable, the Ingstrom Escape Chute requires only manual power to be released and is ready to use within seconds. The chute is simple for everyone to use; adults, children, elderly, disabled, and even injured people on stretchers can descend safely.

This alternative evacuation method employs a vertical tube which is made up of three layers. The outer layer is made from 100% fibreglass, to protect you from flames and heat. The middle layer, special made elastic fabric, creates the braking force which slows your descent by applying limited pressure to your body. The inner layer, made from aramid yarn, is strong enough to carry more than 5 tons making it possible for several people descend

simultaneously. The composition of the fabric is also smooth on the skin, meaning a safe descent.

MOBILTEX EVACUATION SYSTEMS is a Swedish company which has manufactured and sold escape chutes to the world for more than 20 years. Our chutes have been installed around the globe in more than 2000 different structures, buildings and vehicles, from the Sydney Opera House to the 100 metre model to be connected to fire vehicles in Moscow.

Mobiltex Evacuation Systems has got the solution for your evacuation.

For more information:

Mobiltex Evacuation Systems

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MOBILTEX

INGSTRÖM ESCAPE CHUTE

NEW: MSA Modular SCBA System for Fire Service

For every fire service the optimal breathing apparatus model

MSA announces a new SCBA system specifically created for the versatile demands within emergency service applications. In order to fulfil the requirements and budgets for diverse tasks the MSA SCBA system can be completely customised. Users compare and choose from a selection of backplates, harnesses, pneumatic systems, rapid cylinder exchange couplings and monitoring electronic components. MSA, in addition, provides 'presets' for those users who don't want to configure their own SCBA system. Overall, MSA gathered input and conducted interviews from hundreds of active firefighters, representing a strong "voice of the customer" influence into the MSA design.

Established in 1984 in Abu Dhabi, **MSA Middle East** is the regional office for MSA in the Middle East. Our local presence has enabled MSA to be close to its customers and in many cases custom products & safety solutions were tailor made to fulfill the ever demanding needs of exploration rigs in the Arabian Gulf as well as civil defense fire units in UAE & Iraq.

MSA is a global leader in the development, manufacture and supply of sophisticated safety products that protect people's health and safety. The company's comprehensive line of products is being used by workers around the world in the fire service, homeland security,



construction and other industries, as well as the military since 1914. Principal products include self-contained breathing apparatus, gas masks, gas detection instruments, head protection, respirators, ballistic body armor and thermal imaging cameras.

Additional information is available on the company's website at www.msamiddleeast.com

MSA
The Safety Company

INTERNATIONAL FIRE FIGHTER

Departments quick to respond to Pierce frontal air bag protection



More than 40 custom chassis ordered with the new safety system since April 2007

Since PIERCE MANUFACTURING INC. introduced the first frontal air bags available in custom chassis to the fire service earlier this year, the company has received more than 40 orders for vehicles featuring this new safety system.

The frontal air bag system is an integral part of the company's 360° Protection From Every Angle™ program, designed to increase the safety of firefighters as they travel to and from emergency calls.

The air bags can be paired with the Side Roll Protection system and are available on all Pierce custom chassis.

"Our people are our most valuable asset, and their safety is my number one priority," said Chris Sadler, chief of the technical services and special operations battalion of York County, Va. "We need state-of-the-art safety features on our apparatus, and that's why we've spec'd the frontal air bag system on four new Pierce Quantum fire trucks now on order."

Other departments ordering the frontal air bags include Las Vegas Fire Dept., Nev.; City of Portland Fire Bureau, Ore.; Bolivar Fire Dept., Ohio; Crowders Mountain Fire Dept., N.C.; and Newton Square Fire Dept., Penn.

The frontal air bag system protects firefighters in the event of front impact collisions. The frontal air bag system is available on Pierce Velocity™, Impel™, Quantum® and Arrow XT™ custom chassis, exclusively through Pierce. Fire trucks ordered with the frontal air bag system will be placed into service beginning later this fall.

"We're seeing a high number of departments who want this system to keep their crews safer in the cab," said Wilson Jones, president of Pierce Manufacturing. "The development of the frontal air bag system represents a tremendous investment, focusing on keeping fire fighters safer in the line of duty. At Pierce we make the commitment to develop the technologies because it is an important part of our on-going commitment to build the industry's safest vehicles."

A sensor inside the cab monitors the truck's longitudinal accelerations. If it detects a frontal crash of significant magnitude, it sends a signal to inflate a steering wheel-mounted airbag and a knee bolster airbag on the front passenger side. These subsystems work together to dramatically reduce the risk of fatality or severe injury in a frontal collision. Pierce developed the frontal air bag system together with Life-Guard Technologies, a division of IMMI.

Pierce Manufacturing Inc., a subsidiary of Oshkosh Truck Corporation [NYSE: OSK], is the leading North American manufacturer of custom fire

apparatus. Products include custom and commercial pumpers, aerials, rescue trucks, wildland trucks, minipumpers, elliptical tankers, and homeland security apparatus. In addition, Pierce designs its own foam systems and was the first company to introduce the Side Roll Protection System to fire apparatus.



To learn more about Pierce, visit www.piercemfg.com

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New Skum™ Remotely-controlled Firefighting Monitors Unveiled



Tyco Safety Products Fire Suppression Group has unveiled its new generation of SKUM™ brand remotely controllable FJM-EL fog/jet firefighting monitors. They join a line-up of dependable and efficient foam fire protection solutions that are today globally favoured throughout the marine and offshore industries and are chosen extensively for firefighting boats and multi-role pilot boats, tugs, workboats and merchant shipping.



The new FJM-EL monitors are powerful additions to the established SKUM FJM range. All three new models – the FJM-100 EL, the FJM-150 EL, and the FJM-200 EL – offer exceptional flow performance, incorporate electric motor driven elevation and rotation and solenoid valve operated fog/jet pattern adjustment. However, it is the FJM-EL's remote control operation that really sets them apart as fix-mounted monitors designed for the safe delivery of foam or water, either as a solid jet or a fog pattern.

The FJM-100 EL, with the built-in inductor option, delivers up to 6,000 litres of water a minute to a maximum jet throw of 80 metres, while the FJM-150 EL increases this to 11,700 litres a minute to a distance just short of 90 metres. The top performing FJM-200 EL increases the reach to 120 metres and the flow to an impressive 2,000 litres a minute. The foam capacity for each of the models is 340 litres a minute, 585 litres a minute and 600 litres a minute respectively.

These lightweight and compact balanced-design monitors all incorporate an electrical junction box, low-friction bearings for easy manoeuvrability, and feature saltwater corrosion-resistant construction, which makes a major contribution to the monitors' reliability, while minimising the maintenance requirement. All include a manual override option. Other optional components include a control and operating panel, which can be either the standard FJM model or be custom-built, suction hose and valve, and explosion protected EEx (e) and flame-proof EEx (de) electrical equipment.

Further details on SKUM – the Swedish word for foam, pronounced "skoom" – solutions, and the new FJM-EL monitors can be found at www.skum.com, or by email on tspmarketing.emea@tycoint.com, by telephone on +46 303 57700, or by fax on +46 303 58200.



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FIRESA

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Suffolk Fire and Rescue protecting life with CompAir breathing air equipment investment

In an emergency situation, when both lives and company reputation are at stake, modern industry requires rapid and efficient response, particularly from the fire service. Committed to providing fast and effective support to businesses in the region, the Suffolk Fire and Rescue Service has renewed and upgraded its CompAir Reavellife maintenance contract to ensure that its breathing air compressors, a vital piece of safety equipment, can operate at peak performance every day of the year.

The new contract ensures maximum availability of breathing air cylinders and includes all routine servicing and air tests and a 20% saving on parts' costs.

Suffolk Fire and Rescue has relied on the service expertise of local Ipswich-based CompAir engineers for more than eleven years, confident that using the original equipment manufacturer to carry out its maintenance rather than a general service provider offers benefits in the levels of equipment expertise, technical support and the availability of genuine spare parts.

During this time, it has tailored its breakdown and maintenance cover to suit operational demands and now considers CompAir as its preferred contractor as Phil Dillon, Head of Engineering at Suffolk Fire and Rescue explains. "Safety legislation is changing all the time and we need our suppliers to keep abreast of new British Standards' developments so that we have the most advanced and safest equipment solutions at our disposal.

"Over the years, CompAir has proved more than competent to meet this challenge, and as part of the contract terms, is now tasked with advising the service on any compressor modifications or design changes required to keep our breathing air as safe as it can possibly be.

Quite simply, we have deemed it to be both best practice and best value to secure CompAir's services for the maintenance of all of our breathing air compressors. With its OEM status, we can take full advantage of its technical knowledge and expertise thereby ensuring total compliance with any legislative and technical changes in the provision of breathing air compressors and air purity testing."

The British standards for air purity have become increasingly stringent and to ensure continued compliance, the Service initially sent its air cylinders to CompAir's specialist testing facility in Ipswich for quality checks and certification. With units needing to be collected from 35 fire stations across the region, this method was labour intensive and could have reduced spare cylinder capacity at times of greatest need, especially during periods of high operational activity.



Phil Dillon continues, "As all our cylinders are filled from a known and compliant source, the CompAir compressors, we decided that we could save time, travelling expense and ensure maximum availability by monitoring the air purity at the point of compression, rather than via checks on individual cylinders. Our latest contract agreement now includes four visits a year to each of our air and water-cooled compressors housed at seven stations, with one major and one intermediate service plus the vital air purity test on each occasion. Service visits are also scheduled for the four mobile compressors at a time and location to suit our operational need."

During each Reavellife service visit, the CompAir engineer undertakes a variety of performance checks, and the replacement of any consumable items. Suffolk Fire and Rescue Service then receives a full report of the condition of the machine together with a quotation for any essential repair work required. Next-day priority delivery of breakdown parts, including a twenty percent cost saving is assured, as CompAir Reavell guarantees it can fulfil 85% of all parts orders from stock.

Keen to ensure rapid mobilisation of fire crews with the most advanced technology available, Suffolk Fire and Rescue Service continues to invest in its infrastructure. In recent years this has included the supply of a new CompAir compressor at its newly built Newmarket Station. **IFF**

For more information about how Reavellife Service Contracts can maximise compressed air system performance, contact Andrew Peeke on 07824 436406 or email hp.service@compair.com

Waterous Answers The Call For Affordable Proportioning System With Groundbreaking Aquis™

WATEROUS recently announced the unveiling of the Aquis™ foam proportioning system, a technologically advanced, yet affordable foam proportioning system capable of delivering highly accurate and consistent mix ratios for departments using Class A and compressed air foam.

The installed system equips the apparatus with an automatic microprocessor controlled, direct injection discharge side foam proportioning system capable of proportioning all commercially available Class A foam concentrates.

A 16-bit mixed signal microcontroller with 60 kB flash memory, 2 kB Ram and 12-bit analog to digital converter allows the system to receive input from the flowmeter and temperature sensor to control the foam pump motor while providing accurate injection into the foam manifold per the operator selected mix ratio. Temperature threshold settings are also programmed into the software providing additional foam concentrate injection to compensate for colder water temperatures.

The user-friendly controls of the Aquis provide the operator with push-button control of foam proportioning rates from 0.1% to 1%, in 0.1% increments.

For system monitoring and maintenance, the Aquis is uniquely equipped with PC-Connectivity, which allows a qualified technician to perform upgrades, diagnostics and monitor system functions in real-time. The system can also be remotely monitored or upgraded by using any PC with Internet access. This advanced feature allows technicians to easily connect to the Waterous dedicated website to assure proper operation and to update the foam system software by uploading new features and functions as they become available.

Available in two models, the Aquis 1.5 delivers a foam output of 1.5 GPM @ 150 psi (5.7 l/min @ 32 bar) and a maximum operating pressure of 450 psi (32 bar), while the Aquis 2.5 offers a foam output



of 2.5 GPM @ 150 psi (9.46 l/m @ 10 bar) also with a maximum operating pressure of 450 psi. Both models come with a 1-year warranty along with installation, operation and service manuals.

For more information on the Aquis foam proportioning system or for model specifications, visit www.waterousco.com or contact:

Peter Ledger

Waterous Company

Tel: 44 1785 761929

Email: paledgar@waterous-europe.com



HFS



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mobile water supply



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Hytrans Systems

Refinery entrusts SembCorp with emergency response and preparedness



SEMBCORP UTILITIES (UK) has signed a long-term emergency response and preparedness deal with Petroplus, which produces ultra-low sulphur diesel and bio-diesel, kerosene, gasoil, and petrochemical feed stocks at the 40-hectare North Tees site on Teesside.

The facility currently refines up to 117,000 barrels of crude oil a day, and today supplies a significant proportion of the majority of the UK's bio-diesel blend. Under the deal, SembCorp Protection will provide fire and chemical spill protection and emergency planning for the refinery, and its multi-skilled site protection officers will provide fire fighting, medical response and security protection services. All are JOIFF [Joint Oil & Industry Fire Forum] accredited fire fighters with NVQ qualifications in their core activities.

The refinery is a hydroskimmer with distillate hydrotreating. Its main facilities include an atmospheric distillation unit, a gasoil desulfurization unit – also known as an HDS plant – a liquefied petroleum gas recovery unit and a sulphur removal unit.

The deal further strengthens SembCorp's ability to deliver a totally integrated and long-term sustainable asset protection service to its growing customer base, providing an integrated emergency response model for the multi-occupancy chemical site. Other SembCorp customers at the North Tees site include SABIC Petrochemicals and BASF, with which SembCorp already has long-term contracts.

Commenting on this latest major deal, Paul Frankland, SembCorp Protection's General Manager said: "The Petroplus contract is another major vote of confidence in SembCorp's ability to provide outsourced emergency response services that meets the individual customer's unique requirements. Our plan is to develop and grow our business within Europe, but at the same time, continuing to deliver a world class service to our existing customers is of paramount importance to our success."

He concluded: "The North Tees site is one of the largest chemical park clusters in Europe, and the Petroplus deal provides SembCorp with an excellent springboard for additional growth in the North East of England and beyond."

SembCorp Protection is today one of Europe's leading emergency response providers, responsible for safeguarding £14 billion worth of high-hazard industrial assets. Its core skills and offerings embrace the provision of outsourced emergency response services, risk assessments, reviewing clients' emergency protocols or facilities, as well as devising and planning emergency training tailored to specific needs or circumstances. The company also deploys the latest fire protection and engineering equipment to protect lives and assets as well as ensuring business continuity.

Its website can be found at www.sembprotection.co.uk

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Improved Conference Programme for Fire Department Instructors' Conference

The FIRE DEPARTMENT INSTRUCTORS' CONFERENCE in Bahrain (FDIC Bahrain) continues to announce new and additional high profile speakers for the forthcoming conference in Manama, from 9th to 13th December.

Many of the world's leading experienced fire trainers will be sharing their knowledge and experiences in front of the fire industry professionals of the Middle East. FDIC Bahrain is the Middle East's only fire industry targeted event.

Top industry experts such as Dwight Williams and Eric LaVergne will be presenting on Flammable Liquid Fire-Fighting – Minimizing Risk-Maximizing Success



Dwight Williams

– a new conference session recently announced.

Other conference highlights include a presentation from John Mills, the initial commanding officer to the Buncefield Incident – the biggest explosion in Europe since World



Eric LaVergne

War 2 – presenting the First Arriving at Buncefield Case Study.

With significant construction of high-rise buildings within the Gulf region, the conference also has much to offer on the subject, including Industrial and Urban applications of High Angle Rescue with Simon Rogers and High Rise Pre-assigned Duties for Fire Control and Rescue by Clyde T. Pfisterer.

The FDIC Bahrain conference programme has been developed around the specific needs and environments of the Middle East, covering subjects from High Rise/Structural Incidents to Petro-chemical Fires and Emergency Plans to Community Risk.

FDIC Bahrain is a 5 day event that will see over 20 speakers and many leading fire industry trainers providing Workshops and Hands-On-Training at 8 different locations around Manama.

The event also hosts the region's leading

fire industry exhibition, offering over 100 companies exhibiting their products and services for today's fire industry professional.

Full details on the full conference programme, workshops and Hands-On-Training sessions, and how to register, are available at www.fdicbahrain.com.



Simon Rogers

Further information on The Fire Department Instructors' Conference in Bahrain (FDIC Bahrain) can be found by visiting www.fdicbahrain.com



Century Marks New Era for Hunter Boot Ltd

Looking to provide improved levels of safety and comfort, CENTURY has introduced a specialised ladies version of the Firefighter 4000 and announced approval for the new EN ISO 15090 standard.

The new Ladies Firefighter 4000 has been developed to cater for the increased demand, from across the UK and Europe, for a dedicated ladies fire boot. Showcasing the same design as the Firefighter 4000 the boot has been re-scaled to provide the lady fire fighter with a well fitting boot that reduces restriction and discomfort.

Since its launch in 2002, The Firefighter 4000 has gained popularity amongst fire services around the world due to its comfort, flexibility and durability. Having achieved approval for the EN ISO 15090 standard the Firefighter 4000 has demonstrated the ability to provide flame, chemical and electrical protection.

Mark Trueman, Century's Divisional Director, comments: "Introducing the Ladies Fighter will hopefully provide a solution for the growing numbers of female fire fighters around the world. As the fire market is a key part of our business it is important that we act on the feedback from our customers and set about developing the appropriate product."

The Firefighter 4000 is available in UK sizes 5 to 13 and the Ladies in sizes 3 to 8. It has a recommended retail price of £63.00.

For further information please contact Chris Grabowski on 0207 439 2780 or email chrisg@sputnikcomms.co.uk

Corrosion free Emergency Showers – standing the test of time

Harsh environments are frequently the most hazardous for those people working within them, and issues of safety are paramount. But severe conditions can often compromise the operation of health and safety equipment, presenting enormous challenges particularly where maintenance can be difficult and expensive.

In many industries, the most efficient emergency facility is a decontamination shower unit, therefore it is vital for such equipment to work first time every time. However where you have extreme weather conditions, or an atmosphere which is tainted with sea salt, corrosion becomes a serious issue. Given that a shower may stand unused for a considerable amount of time, the process of making certain that it will work when needed begins at the design stage. It is also vital for equipment to meet both the efficiency agenda and health and safety regulations, including ANSI and DIN standards

Allen Yates, managing director of SHOWERS AND EYEBATH SERVICES, explains: "Corrosion-resistant safety showers manufactured from GRP and 316 stainless steel, with ABS internal pipe work, are far more effective than traditional powder coated galvanised units, and guarantee superior strength and longevity for installation in any environment.

"Maintenance costs on older types of showers can be high, and even higher if they

are corroded beyond repair and need replacing. But, it's not just the units – the fitting to existing pipework can also be expensive.

"This is what a major chemical refinery in Runcorn faced as being situated near the sea had seriously corroded their emergency shower equipment. However, given today's bespoke manufacturing methods, showers can be tailored to site requirements or modified if necessary.

"In the Runcorn situation a number of free-standing units were installed to replace unusable equipment, but modified around the sites existing pipework. We tailored the units to fit the space exactly, which helped to keep costs down...and the new units were less expensive than the range they replaced, so excellent value all round.

"And going hand in hand with keeping the units working effectively, they need to be self draining to avoid the risk of freezing, or contamination with Legionella. The corrosion resistant material should also be manufactured using high visibility colour schemes with pipe-work protected by a robust, colour infused fibreglass jacket. If the jacket chips, it is coloured throughout, so there's no need for repainting to maintain its visibility."

Contact Showers & Eyebaths customer services on +44 (0)1744 889677

Cardiff International Airport Unveils Its New LPG Powered Aircraft Fire Simulator

Cardiff Internal Airport (CIA) Fire Service has been training their fire fighters in house under maintenance of competency scheme for over five years. Previously fire fighters would have to re-validate their competency in role at an approved training provider. For the Civil Aviation Authority to approve such a scheme Cardiff Airport had to meet specific criteria, not only did they have to have qualified instructors, assessors, internal verifiers and a robust training and assessment scheme in place, they also need to have the training facilities to carryout such training and assessments.

Cardiff met this criteria by having the required facilities, which include a classroom with a state of the art smart board which can display over eighty presentations from a structured learning programme, a number of other facilities which can accommodate breathing apparatus, confined space and heat a smoke exercises.

There jewel in the crown is now the newly acquired LPG powered fire training aircraft simulation rig which to date is the only one in the U.K supplied by German company Dräger safety. This replaces the old aircraft simulation unit which was a pressurised kerosene version and was deemed not to be environmentally friendly. The Training Manager at Cardiff Perry Latham says that "not only is the simulator more environmentally friendly, it is safer to use because of the up to date safety features and the various scenarios this allows safe realistic training to be carried out"

The aircraft fire simulator burns LPG gas both in liquid and vapour form depending on which scenario is requested, the following gives a list of the exterior and interior fires that can be performed on the rig:

Exterior Fire Areas

Dash 8 engine
Dash 8 undercarriage
B767 engine front
B767 engine rear
B767 undercarriage
Fire screen
Split flange fire
Fuselage
Spill fire

Interior Fire Areas

Lavatory
Flashover
Single aisle Seat fire 1
Twin aisle Seat fire 2
Galley
Overhead Locker
Cockpit

As can be seen from the list of fire scenarios the aircraft is a mock up of both wide bodied Boeing 767, narrow bodied A320 and Dash 8 aircraft, the list of scenarios is made more realistic by the use of smoke generators which are attached to various areas of the aircraft, which allow the simulator to be engulfed in smoke enabling fire fighters to carry out training in more difficult conditions.

The front half of the fire rig interior simulates a single isle aircraft whilst the rear half is elevated and simulates a twin isle, the exit doors simulate both Boeing and Airbus type opening this allows for realistic entry procedures when training, the rig also has scenarios which can be utilised for industrial fire fighting training, these are the fire screen, spit flange and spill fire scenarios.

Senior Airport Fire officer Ray Imperato says "The



rig provides us with a state of art, high specification realistic training simulator that not only meets all our varied fire training scenarios but at the same time significantly reduces the environmental impact that our training causes. Being completely fuelled by both liquid (external fires) and vapour LPG (internal fires) using Dräger's specially designed nozzle technology allows for a very realistic type burn more akin to aviation fuel than gas leading to a more realistic training environment for our Firefighters".

The facility is multifunctional and is configured to cover all the major aircraft types that operate in and out of Cardiff Airport.

To compliment the state of the art training facilities at Cardiff Airport a Commercial Business Training & Development Centre aimed at local businesses in the community has been established which utilises the industrial scenarios on the simulator to provide training for emergency response teams at several industrial complex within South Wales.

The simulator has the most up to date safety features which include:

- Gas sensors and transmitters that immediately shut off the gas feed, fire areas and smoke generators and activate the seven ventilation fans which are located throughout the simulator in case of a propane gas concentration of 25% UEG. The smoke removal time for the simulator is 120 seconds.
- Emergency shut off valves that are mounted throughout the simulator which also initiate the above.
- Thermal sensors which will initiate the above if the temperature reaches 250°C at a height of 1.00m and/or a temperature of 650°C at ceiling height. **IFF**

For further information contact:

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Skum™ protection for high risk environments



Providing the right combination of firefighting agent and delivery system has led to the TYCO SKUM™ brand being recognised globally as the industry's leading provider of dependable and efficient firefighting solutions for high value, high risk petrochemical, aviation, marine and power plant applications.

SKUM designs and manufactures sophisticated foam-based extinguishing systems and equipment to safeguard installations where a fire has the potential to have catastrophic economic, environmental or life-threatening consequences. In addition to developing innovative solutions, such as the SKUM HOTFOAM™ high-expansion foam system that is designed for use in enclosed spaces, the brand is also at the leading edge when it comes to foam delivery systems and engineering.

The SKUM brand's sophisticated fixed or mobile delivery systems do away with the need for the massive and urgent deployment of equipment and firefighting personnel. They also ensure that a fire is responded to in the shortest possible time, so reducing the potential for the fire to develop into a major incident. SKUM was first to develop a semi-subsurface system for storage tank protection and this, and other SKUM systems, are today in use throughout the world providing around-the-clock protection for oil, LNG and other flammable liquid storage tanks and bunds.

The SKUM offering also includes an array of fixed foam generators and fixed monitors that can cost-effectively protect storage tanks and associated spill or ground fires. The current line-up also encompasses portable monitors and

trailers that can be quickly and easily deployed. These are used extensively by municipal and industrial fire brigades and

professional firefighters.

SKUM monitors are noted for such characteristics as long throw capability and fast knock down. Many, such as the latest FJM-EL ranges of electric remote control of monitors, incorporate features not readily found on other systems on the market, and use materials that are more resistant to the corrosion found in marine or harsh industrial environments. Several of the SKUM water or foam monitors are less than half the weight of some competitors' comparable models.

Further details on SKUM – Skum is the Swedish word for foam, which is pronounced “skoom” – solutions and expertise can be found at www.skum.com, or are obtainable by email on

tspmarketing.emea@tycoint.com, by telephone on +46 303 57700, or by fax on +46 303 58200.

California department wants more room for equipment and less for bulky pumphouses

San Bernardino orders Seven Pierce PUC Pumpers

PIERCE MANUFACTURING INC., North America's leading fire and rescue apparatus manufacturer, received an order for seven Pierce Ultimate Configuration (PUC) pumpers from the San Bernardino City Fire Department, Calif. The order for the seven Pierce® Arrow XT™ PUC pumpers is scheduled for delivery in May 2008.

“Our department is responding to a wider range of emergencies and the need to carry more specialized equipment is increasing,” said Mike Alder, battalion fire chief, San Bernardino City Fire Department. “With the Pierce PUC, we’ll be able to add compartment space on a shorter wheelbase vehicle. And we’re confident the ergonomic layout will reduce firefighter injuries.”

The PUC is an industry-changing multi-purpose response vehicle that is engineered to eliminate the need for a bulky pumphouse. The PUC also features a simplified two-step pump shift operation and redesigned pump panel for easier use. Hosebeds, crosslays and ladders are now all accessible at lower levels for better ergonomic use. In addition, the entire pump system is located above the frame for easier and quicker service and maintenance. With a shortened wheelbase for improved maneuverability (as low as 172”), the PUC also provides up to 500 cubic-feet of storage.

“Fire departments told us that they need safer, easier to service apparatus with more compartment space without compromising wheelbase, which is exactly what the PUC delivers,” said Wilson Jones, president of Pierce. “We’re very excited in the tremendous interest and support the PUC has received from departments like San Bernardino.”

The San Bernardino City Fire Department serves a resident population of more than 220,000. The department's response area encompasses 59 square miles, and includes 19 square miles of wildland interface area, a major rail yard, an international airport and two major interstate freeways. South Coast Fire Equipment, Inc. of Ontario, Calif. is the local Pierce dealer.

Pierce Manufacturing Inc., a subsidiary of Oshkosh Truck Corporation [NYSE: OSK], is the leading North American manufacturer of custom fire apparatus. Products include custom and commercial pumpers, aerials, rescue trucks, wildland trucks, minipumpers, elliptical tankers, and homeland security apparatus. In addition, Pierce designs its own foam systems and was the first company to introduce the Side Roll Protection system to fire apparatus.

To learn more about Pierce, visit www.piercemfg.com

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Taking The Complexity Out Of Lifting

Lifting is essential in a rescue operation. Situations involving a truck or train accident lifting is essential to quickly lift a heavy object, especially in a confined space like a tunnel. Nothing is faster deployed and more controllable than a lifting bag, but lifting is also seen as complex. In this article I discuss the basics you need to know about emergency lifting. What pneumatic lifting bags can be used for, the fundamentals behind lifting and how they should be operated. This will give you insight to understand what type of bag designs work best for you. Basically, after reading, you will understand why lifting can be easy and useable in emergency situations.

By Jack Kusters

Managing Director for
Artesis Academy

Why emergency lifting?

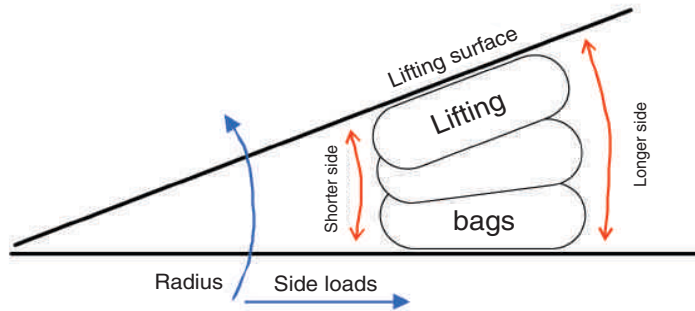
- Lifting is generally used for two objectives.
- 1** To create space to free an entrapped victim in the case of collapsed structure
 - 2** To lift an object to be able to perform extrication, like a accident involving a truck and car.

It is thought that lifting is mostly used during a collapse structure, but this is not the case. The need for lifting during a road traffic accident is much greater. An increasing amount of accidents are happening with truck and busses then before. Probably due to increased traffic and pressure. As long as the load is resting on the car, extrication cannot be performed! Shifting of loads can have a huge impact on the casualties. Besides lifting, bags are

more frequently being used for other applications. The small insertion height and large stroke make it ideal for situations a ram cannot be used. Imagine a car against a wall that needs to be displaced.

Why lifting bags?

In the situations described lifting bags are by far the best tool to use. Nothing can be faster and more controllable than a lifting bag. Cranes can never make it on time to the accident where a crane cannot lift more controllable than a lifting bag. Cranes furthermore have trouble making it to the needed location. Think debris and traffic during a accident. A accident in a tunnel render cranes unusable due to the limited ceiling height.



Also important, but easily overlooked is that the operator is not trained to handle the complex and stressed emergency situation.

Sometimes hydraulic tools like a ram are used for lifting. In a recent article I described the differences between lifting with air and hydraulic. The conclusion was that only in rare cases hydraulic ram can be used, but not advisable. Besides the big insertion height, limiting the use, the lift will be made from a small point with the risk of puncturing through the object. Furthermore rams cannot, or with high risk, cope with the radius with will be explained in the paragraph.

Fundamentals of lifting?

It is essential to understand the fundamentals behind lifting. Mistakes are made because the fundamentals were not understood and correct procedures were not followed. Understanding fundamentals will give insight.

In emergency lifting two fundamental things:

- 1** Radius and stability during a lifting operation
- 2** The power needed to reach height

Radius

During every lift a radius, or arc movement is created. An object is never lifted straight up into the air. (If you do, it means you are floating a load, which

should never be attempted in an emergency situation seen it is uncontrollable). One fixed point should always be secured and act as rotation point. Lifted from one side a radius will be formed, creating a side load. The side loads want to push the lifting equipment out or make them unstable. Your tooling should be able to cope with this radius, or more importantly the side loads created. Side loads limits your lift in height and make it hard to control.

A bag can cope with the side loads if it can be connected to each other and have high pressure. The high pressure creates stability, as the bags more solid.

There are some remarks about the connection between bags. In the past bags had dimples or Velcro to get some grip on the object you are lifting. This is by far not enough grip to cope with the side loads created by the radius. The connection between the bags need to be strong, and in

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the middle of the bag. Why a connection in the middle? In the middle is the area where the deformation of a bag is minimal to none. The radius will turn the bags making one side shorter and the other side longer.

Power to height ratio

With lifting bags the mathematical law (force = pressure x area) is essential to understand. The force of a bag is created by pressure inside the bags and the area that has contact with the object that is lifted. The larger the pressure and surface area, the larger the force you will have.

A bag that is inflated will decrease the lifting surface the higher it goes, along with the force (force = pressure x area). So, the higher a bag goes the lower the power generated. Depending on the shape and pressure, a bag loses power quickly and may not have enough capacity to reach the height you anticipated to reach. That is why bags that can be connected to each other are easier to use. Also important to understand is that the surface you are lifting covers the bag as much as possible, as it is not lower the capacity also seen you are not making full use of the bag.

Procedures of lifting:

The main objective is to lift an object to a needed height safely and controllable. This all boils down to creating the least amount of risk for the operation and do it in a timely and confident manner. I would advise a 5 step approach Think, Crib, Lift, Follow and Secure the object.

Please keep in mind that these are basics, and to be able to perform lifting a proper practical training is necessary.

Think: Look carefully at the scenario and the object. Make a plan keeping the fundamentals in mind. Choose the locations of the equipment; bag, cribbing blocks and struts. Determine the weight of the object and the height you need to lift, to be able to determine the type of bag. If bags can be connected, the amount that you are going to stack, or if bags cannot be connected, how you are going to do your cribbing.

Crib: All aspects that can move during or after the lift need to be cribbed and secured. Think about wheels, rotation points. Always look at the object and think; what areas, or objects can move, and secure them! Always put a crib block behind a wheel or object. If possible but the breaks on.

Lift: If cribbing and securing of moving objects is done, lifting is simple. Make sure you have placed the bag(s) in a position that can handle the weight of the load. During lifting pay attention to the



Pic courtesy of ResQTec



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whole object and the bags. Look at the radius of the bags and if you are going too far. If you go too far, bags can pop out. Like discussed shape and connectors reduce this but always pay attention to the behavior. During the lift stay out of the pop out zone. This is the zone where the radius is pointing towards, and take a additional safety range. There is a rule of thumb called the shoulder to shoulder. Lifting collapsed structures the height never needs to go higher than the width of the shoulders, as this is enough to free a victim generally speaking. This being said, there are always exceptions to the rule so your tools need to be able to go higher. A

road traffic accident may require to lift the truck further to be able to extricate.

Follow the load: It is often thought that when lifting it is only necessary to secure at the end of the lift, but no that is not enough! Always follow the load with a tool not used for the lifting operation. If the load shifts or the load drops it is caught by the tool stabilizing the object. For small heights this can be cribbing blocks and for higher objects struts or shoring tools are most generally used. There is a saying in the US by a colleague that says, lift a inch, crib an inch and fully agree with that statement.

Securing: Before performing other task always first secure the object, so that it cannot move anymore and the load is not only resting on the bags anymore.

Types of Lifting bags

Knowing the fundamentals and basic procedures it is easier to explain the differences between equipment and what may be better for your purpose. The differences are best explained by the aspect mentioned, like pressure, connection, surface area, and lifting area vs cribbing. All these aspects are important and determine how easy the bag makes it to lift a object.

Types of bags can be easiest divided up by the working pressure. There is Low high (1 bar), High square (8 bar) and New Technology round (10 bar pressure) bags. As explained pressure gives stability and capacity. Low pressure bags have height, but

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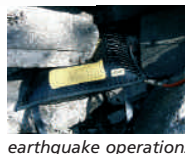


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low capacity where high pressure bags have capacity but no height. New Technology bags combine height and capacity.

Low pressure bags are mostly used in recovery operations and not in emergency anymore. They are too unstable to cope with the side load and don't have the capacity. They are unstable not only by their low pressure, but also their single element structure. Lifting in small steps creates a much more stable lift.

High pressure square bags have high capacity but small height. The downside is that they lose capacity quickly because their lifting surface becomes small ($\text{force} = \text{pressure} \times \text{area}$). 8 bar bags cannot be connected to each other to reach the necessary height. Making time consuming cribbing necessary. When lifting with square bags it is important to remember that the bags are made from rubber and Kevlar. Sharp objects cannot be lifted and will puncture the bag. To create a connection it is tried to place dimples, Velcro or straps to create some connection between 2 bags, but these do not give enough strength to deal with the side loads. Advice is not to stack bags on top of each other that do not have a strong connection between the bags. The smaller square bags are ideal if a small lift needs to be made, like hands or feet stuck in machinery.

The New Technology combine height and capacity due to their shape and a metal lifting surface. This metal surface does not become smaller when lifting keeping your capacity ($\text{force} = \text{pressure} \times \text{area}$) high even at height. Because they can be connected in to each other by a metal connector in the center of the bag, they can cope with the side loads. This connection also allows to use several bags for a lift, adding to the capacity and stability. The metal bottom and top plates allow it to lift directly on point loads diminishing the need for cribbing or the risk for puncture. Working with New Technology bags I see numerous advantages and make lifting quicker and easier.

In general keep in mind that the safety factor of a bag is at least 4. This will guarantee that the product is constructed well and made from quality materials.

To learn more about emergency lifting or training contact Jack Kusters, at Artesis Academy. **IFF**

Jack Kusters is an expert in extrication and rescue in general. With over more than 29 years as a fireman he has worked for several organisations. Several educations and training later he was promoted to fire chief but his love for the extrication stays. He wrote several books and articles and gives lessons all over the world. Many tools and equipment that we use now for extrication is started as a brainwave from Kusters. These included the development of hydraulic tools, stabilization and lifting equipment for different manufacturers. Begin 90's he developed a new system for extrication for the Dutch emergency response services. This became known as the "Kusters" approach.

Kusters is now managing director for Artesis Academy. An international advisory organisation helping fire fighting services in several areas like training solutions, development of procedures and building of training centers.

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Workwear – Who, When, Wear and Care!

Go back perhaps only fifty or sixty years to when industrial and commercial employees turned up for work in all that they had, got it dirty, took it home to wash and repeated the cycle. Then some enterprising individuals, responding to ever increasing legislation and available budgets, started the Workwear revolution. The Managed Workwear Rental service to protect the wearer, promote the corporate image and off-load the routine issues for the employer onto the service provider was booming.

By Richard Newton

Principal of OPEQUE
(Optimising Productivity
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There soon followed textile technology development, more legislation and fashion, but most significant was the 'industrial transformation' to what is now the vast commercial and services sector norm. You would think we could keep pace with all that and still have a perfect system. So let's look at a few workwear scenarios and see what is going on today.

Is the garment fit for purpose, best suited to the application, cleaned and maintained and being worn enthusiastically by the wearer for all its properties? Forget the hi-tec bits for now, just go to the supermarket and DIY store, the local garage, green-grocer, window cleaner, etc. Procuring the correct garment is itself a major project, but with internet access and the expertise of the suppliers, let's assume that's a done deal. Anyone can buy the garments and use them as they wish,

but beware the pit falls even for these relatively basic products when you take on home or launderette washing.

Wash processes must suit the fabric, colour, soil type and degree. The work load must be classified of course; no point in mixing reds and whites, mineral soil with proteinaceous and poly/cotton blends with cotton or wool. BUT if any element is incorrect (and you would be lucky to find a machine that actually does exactly what it says) then very simply it can all go wrong and you're left with a dirty, faded and probably different sized garment.

Tolerable perhaps, but not ideal and when the work force all have different shades of gear, trouser legs, arms or Polo bodies and fleeces are the wrong dimension and then worse still the jacket or coat smell a bit and the garage mechanic

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gets a mild dermatitis condition – it makes you think. Similarly, don't underestimate the dangers of taking your work soil home and mixing it all with the kids' stuff in the same load. Hygienically clean, thermally disinfected, soil washed out and residue rinsed to neutral? No need to explain; those bits of yours which end up next to your skin or on the dining table may not be quite as wholesome as you think.

Laundering really is quite straight forward though and with those excellent care labels that we study hard to understand (a new set is currently running through European standards and will be available soon, just to confuse?) and then match with the machine operating settings (often just

programme A, B or C), we chuck in the sachets or net-bagged tablets, press START and forget. Maybe we add a bit of conditioner if not already part of the sachet/tablet combo or perhaps this is entrusted to the fresh air drying line or more likely the impregnated fibre sheet that goes in with the tumble dryer load. Over temperature or over dried and seldom 'cooled up or down' the final article emerges. An aggressive hand iron, fold and it's ready for another innings. What was that wash temperature again?!

To get it right first time and every time is of course possible, but needs attention to detail and we haven't even considered repairs, garment life or processing cost. So, to be safe and care for

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The next category is the posh bit (corporate or front of house apparel) which as above can start off really well, but with the wrong care and maintenance can very soon and expensively lose its form. The confusion over dry clean or wet wash suitability, garment construction and inter-linings, body odour as opposed to work soil and the enhanced finished quality all add to this mine-field for the hotel, restaurant, bank and building society, air-line desk and perhaps even you. These garments are generally of sturdier construction and fabric than fashion garments, but require the same care to maintain appearance and life.

Now for the exciting ranges where we'll consider some special applications. Before getting into heavy PPE legislation let's look at the food, pharmaceutical, electronics and health-care sectors, where the garment essentially protects the product, not the wearer.


**The Food industry in all its
guises, from abattoir to the
sandwich stall is legislatively
tight and the awareness level
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This is where the responsibility for error really kicks in and the repercussions for getting it wrong can at worst be fatal and not necessarily to the wearer, but to an innocent third party. Laundry processes, their validation, control systems, procedures, risk assessments, method statements, HACCP (hazard assessment at critical points)/RABC (risk analysis and bio-contamination control) and auditing to a recognised standard have been developed and are well practised – SURELY.


The Food industry in all its guises, from abattoir to the sandwich stall is legislatively tight and the awareness level is high – or is it? We are still having to be educated on how and when to wash our hands, so I'm not so sure. The key requirements for garments in this sector are that they must not allow things to drop out of pockets, should not have overlapped seams or folds which entrap food particles, have no loose buttons or threads and are hygienically clean. All completely achievable with the right controls and management.

The pharmaceutical and electronics industries require clean room technology to achieve particle and static free, hi-tec, lint free fabric garments. The control of garments in this sector is exemplary. Perhaps that is because the products are so expensive?

In the health-care sector, the range of standards both required and practised is massive; the laundering and sterilising of theatre pack reusable garments, the pristine matron level uniforms, the



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scruffy house officer's coat, the nurse's uniform worn on the bus as well as the ward, the cleaning and maintenance staff. Then consider the care homes, the dental and GP surgeries and the developing expert pharmacy chains. For all these applications the correct garment must first be procured and then maintained in service where the necessary attention to detail is paramount.

Right now and even with so many issues pending in respect of hospital practices and cross-infection there is continuing debate on what standards should apply. The same rules apply as to general workwear, but often the construction and fabric are lighter, the design is more complex and they must be treated with greater care. Garments should always be washed independently from other items and at guaranteed conditions which achieve chemical or thermal disinfection.

Now the real test, PPE – Flame retardant (both inherently resistant and retardant by treatment), chemical resistant, high-visibility and their various combinations. Procurement, maintenance and inspection here take on a whole new level,

- best to keep a record from new of the number of washes and always examine for residual soil, tears and holes and missing fasteners;
- chemical resistant garments generally require periodic treatment with the approved anti-penetrative finish and this must be recorded and carried out by an expert;
- high-visibility garments can be checked against original fabric swatches for degradation and the reflective strips can be tested using a comparator/verifier (available from manufacturer).

Assuming we do get the product and its application as well as processing right, the next hurdle is still to get the welder, motorway construction worker, etc. to agree to wear the PPE and even then, correctly. It's the same with washing hands, bicycle helmets, and mobile phones in cars; we haven't quite reached the same success as with seat-belts, motor-cycle helmets and hard hats. For Workwear to be accepted and function correctly in all its forms, the designers, employers and wearers must share the responsibility for creating the right product, investing in its correct care and main-

In the health-care sector, the range of standards both required and practised is massive; the laundering and sterilising of theatre pack reusable garments, the pristine matron level uniforms, the scruffy house officer's coat, the nurse's uniform worn on the bus as well as the ward, the cleaning and maintenance staff.

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because in the awful worst case eventuality, the repercussions and penalties are immense. All the procedures to ensure the correct care, i.e. fabric recognition and sorting, soil type and degree assessment, process specification and validation are in principle the same as for the most basic workwear and if strictly applied, will realise correct functionality. However this special laundering knowledge is key to maintaining the fabric, its treatment, any adornments (reflective tape, emblems, etc) and surely dictates a managed service with resultant confidence that the garment is supplied to the wearer in a condition which is fit for purpose and affords the requisite protection.

The unspecified process will have no validation, may damage the properties of the garment, cause it to retain residual soil (which may be flammable) and adversely impact garment life. These in addition to the colour loss, shrinkage and risk of contamination render home or launderette washing inadvisable.

To test your PPE clothing (this should only be undertaken by a competent, validated authority):

- flame retardancy is difficult to check by non destructive means, but it may be possible to sacrifice a portion(s) of the fabric and send to an accredited laboratory for testing;

tenance and then wearing it. So, when you set out to buy Workwear for your staff, think of all these things and consider if you or they really want this responsibility for staying clean and alive.

A very sensible option is to contract out the service which implicitly shares the responsibility and ultimately ensures that your team are maintained comfortably, clean and protected from the perils of the workplace. The expertise and efficiency of a professional contract laundry has other benefits; look at the environmental and cost impact of laundering and note that by contracting to a managed service, industrial processing utilises:

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compared with typical operating costs for a laundrette or domestic machine. And let's not forget stock costs, repair costs and the sheer delight of hassle-free pass the buckology to ensure it is never our fault when a garment doesn't turn up or it's too small or fails to work!

Workwear is key to protecting and promoting your business. Wear it, treat it with respect, monitor its condition; it will not let you down. **IFF**

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Challenges To The Designer:

Exiting From High-Rise & Large Mixed-Use Buildings

**By Virginia Charter
and Jeff Grove**

RJA Group, Inc.

High-rise and large mixed-use buildings are located throughout the world. These facilities have the potential to contain a tremendous amount of occupants, especially gaming resorts. Finding a way to egress building occupants in an emergency can be a challenge depending on the complexity of the facility and the uses within the complex. When multiple uses come together in one of these facilities, the exiting challenges can grow exponentially. These facilities are sometimes referred to as “Mega Resorts”.

Typically designed around a casino and hotel premise, Mega Resorts have developed to include all the amenities a consumer could imagine within one facility. Obviously, this is intended to keep occupants at the same place to maximize revenue (e.g., gaming, entertainment, retail, restaurants, etc.).

Las Vegas, Nevada and Macau, China are two such destinations that have taken the concept of the Mega Resort to new levels. Although Las Vegas has been a part of the resort industry for over fifty years, ideas for larger and more encompassing resorts to replace those previously in operation has been the norm over the past twenty years. These facilities are attracting tourists by the millions each year. Macau is relatively new to the resort industry, but has not suffered for lost time and is predicted to

be just as glamorous and stimulating as Las Vegas.

Dubai, located in the United Arab Emirates, has also recently entered the construction of extremely tall and large facilities. Although not associated with gaming, the facilities in Dubai do not lack in size or substance. However, these facilities also present significant challenges to the designer to determine how to address a satisfactory means of egress.

The layout of the Mega Resort typically includes a parking structure, podium levels, and residential high rise towers. The podium levels are typically arranged to house the amenities for the public. Whether it be theaters to attend Broadway style productions, a retail complex that would rival any local mall, an expansive pool, multiple restaurants and nightclubs, or a wedding chapel; these uses, that by themselves could pose unique egress

Pic courtesy of RJA Group



concerns, have been incorporated within these mega facilities to push the limits of the egress system. The number of podium levels varies from resort to resort and is generally between one to five levels. The hotel tower provides thousands of rooms and suites for overnight guests.

Challenges

Typically, the larger the resort, the greater the challenges presented for life safety related systems within the facility. Each facility competes with its predecessors to have a more elaborate theater, a larger convention center, a more expansive casino floor, taller residential tower accommodations, unique shopping opportunities, varied dining experiences, and amenities to better a patron's overall experience and entice future visitors. Tower heights, large occupant loads, multiple uses, proximity to property lines, paths for exit discharge, common path of travel, and travel distances are common challenges for these resorts.

These resorts contain just about everything a city does. Almost all the major occupancies called out in the International Building Code (IBC) are in these facilities. In addition to the amenities provided to patrons (gaming, shopping, dining, etc.), there are just as many back-of-house support areas. Many times these areas are even located on intermediate levels that patrons do not even know exist. These support areas often include offices, mechanical and electrical rooms, storage, kitchens, and loading docks. On occasion, these back-of-house areas can also include hazardous occupancies, such as fuel for emergency generators and fire pumps, bulk pool chemical storage, etc. Because of the multiple occupancies located within the resorts, additional challenges come with these mini-cities. Occupancy separations, high security areas, the desire to keep the public out of unoccupied spaces, or employee only areas also add complexity to the egress design. Additionally, these massive properties are all contained within sites that can range from 20 to 70 acres. Compare this to a city whose high density could be spread over 10-square miles. Each resort is jammed packed into these sites and the building or buildings can also approach adjacent property lines. Space within these facilities is at a premium and

exiting is not always the initial focus of the designers.

Sometimes coinciding with these mega resorts and other times standing alone, it is common practice to have residential or office high rise towers in excess of 500 feet. Sometimes these facilities reach more than 1,000 feet above grade. These heights lead to new challenges in exiting.

Within every large facility there are multiple high-rise stairs serving the hotel tower, levels of the podium, and the parking garage. Many of these stairs face the challenge of exit discharge due to their location within the facility. Many of these stairs are not located on the exterior portion of the facility. As such, these stair terminations reside in the middle of the resort. Once occupants achieve a level of protection (i.e. a two hour exit enclosure), that level of protection or greater must be provided to the exterior of the building. Through the use of intermediate levels, horizontal stair transfers may be added to avoid having a two hour enclosure running through the main podium levels.

With facilities of this magnitude, exits need to be distributed evenly. The IBC limits the maximum distance an occupant is allowed to travel before reaching an exit, as well as the maximum common path of travel. Typically the main podium levels of large resorts stretch well over 1,000 feet in one dimension. Now, not only is capacity an issue with exits, additional exits need to be provided and placed to address maximum travel distances. Maximum travel distances are quantified within the IBC based upon the occupancy group, and whether automatic sprinkler protection is provided. For most occupancies within these fully sprinkler facilities, the maximum travel distance from any point to the closest exit is 250-feet.

Another component of the means of egress system is the limitation of the maximum common path of travel. Common path of travel is defined in the IBC to be "that portion of exit access which the occupants are required to traverse before two separate and distinct paths of egress travel to two exits are available." Common path of travel challenges within these facilities typically occur in back-of-house areas and large residential units. Rooms or spaces that may require only a single exit due to a limited occupant load would require a second exit if the common path of travel was exceeded.

The maximum occupancy for these facilities rivals the total population of many cities. For example, the average new gaming facilities must accommodate anywhere between 70,000 to 100,000 occupants worth of egress capacity, with some of the larger facilities approaching over 250,000. This is due to not only these facilities being very large, but also the IBC requirement that all portions of the building be considered to be occupied simultaneously. Large occupant loads are a major concern for the egress systems within these Mega Resorts, since available floor space needs to include exits. Space within these resorts is at a premium and the location of these exits is a critical balance. Additionally, the largest of these occupant loads are not always located at grade level. As a result, there could be 20,000 to 40,000 occupants on each of the podium levels. These loads could account for up to 750 feet of exit width. This is a considerable amount of space when trying to maximize revenue generating space within a building. It has also become common practice to put large assembly uses at the top of residential towers, such as night clubs, restaurants, pool decks, etc. This issue results in larger exit stairs that potentially take away from guest rooms, condominium units, or even leased areas on lower tower and podium levels.

Solutions

There are several solutions that can be used to alleviate the impact on exit width for these facilities. These solutions may all need to be used depending on the level or sometimes only one will resolve the exiting issues. Two examples of prescriptive code compliance that may address exiting challenges include scissor stairs and horizontal exits. A third solution to improve the impact on exit capacity, when allowed by the local authority, is separate evacuation zones. There are two additional solutions for high rise buildings to aid in the evacuation occupants. These solutions include the use of area of refuge floors or the use of elevators in full building evacuations. Some facilities may require both.

Scissor stairs are a great way to add to the capacity of an exit without significantly increasing the width. Each scissor stair will have two separate entrances with two separate sets of treads that criss-cross each other. However, it is important to remember, that scissor stairs can only add to the capacity of an exit. Even though there are two separate entrances into this stair, it can only be considered as one exit since they are essentially within one stair shaft. It should be noted that some international codes recognize double helix stairs as separate exits. These are similar to scissor stairs in that the two sets of treads criss-cross each other. The difference is that each set of stair treads, landings and stair entrances are separated from each other by two-hour construction. Although explicitly not permitted by the IBC, this means of stair construction has been utilized successfully in several areas of the world to address required additional exits.

Horizontal exits are another solution that can be utilized to approximately double the number of exits



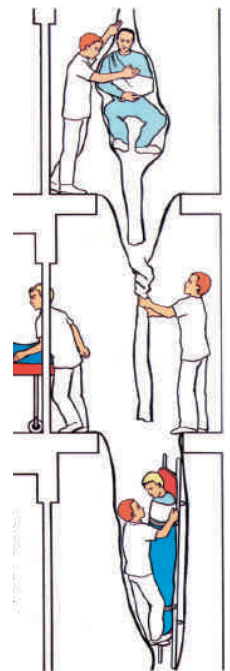
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and the amount of exit capacity without a need for additional stairs. Since up to 50 percent of the number of exits and capacity can be configured with horizontal exits, this can help reduce stair widths within the building. Horizontal exit walls are required to be continuous from the exterior wall to the exterior wall of a building creating a two hour fire resistive constructed separation between the two areas. Once occupants have crossed the two hour barrier, they are considered to have exited the area being evacuated. However, on the opposite side of the horizontal exit wall, a refuge area

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providing sufficient room for the exiting occupants, as well as the occupants already anticipated in that area. From the refuge area, occupants are required to be provided with a clear path either directly to the exterior or to a rated stair enclosure to take them to the exterior of the building. Horizontal exits are an effective means of egress for convention centers, ballrooms and theaters, as well as dividing casinos from other areas of the resort. These inherent architectural boundaries for these uses can then be effectively be utilized for horizontal exit purposes. For podium levels located at grade, the use of horizontal exits and multiple exterior exits is usually sufficient to meet the exiting needs.

When allowed by the local authority, a third solution that is typically used on high density podium levels is separate evacuation zones. Evacuation zones coincide with the fire alarm, sprinkler, and smoke control system boundaries and naturally utilize the horizontal exit walls as some of the boundaries. When using separate evacuation zones, the entire floor no longer exits at the same time. Occupants within one zone would exit, while the other zones would remain in normal mode. This way both exit stairs and horizontal exits can be used by multiple zones and in a sense utilizing the same exit capacity many times. Evacuation zones are a viable option because with these mega resorts the type of construction (Type IA or IB) is the most restrictive and in a sense each zone is enclosed by two hour rated construction. Using separate evacuation zones is an extension of the provisions allowed for a horizontal exiting scheme, since not all areas of the floor will be evacuated.

Due to the significant height of high rise towers, additional protective methods may be considered and utilized for the overall exiting system. Although not a requirement within the IBC area of refuge floors are a means to allow occupants to gather and rest during an event within exceedingly tall high rise structures. Typically located every ten to thirty levels depending on the project and jurisdiction, refuge floors are either open to the atmosphere or completely enclosed. Refuge floors are of the same construction of the stair shaft that it serves and sized to allow for three square feet per person of the floor of alarm, floor above, and floor below since those would be the floors evacuated. Occupants can enter these levels only from the exit stair. These levels are used to have occupants gather for

further instruction by trained personnel (either building management or fire rescue). These levels can also be used as a resting place for occupants because should they want to continue, occupants would re-enter the stair and continue down to the next refuge floor or to the building exterior.

Though it is not a new practice and not recognized by the IBC, the use of elevators for ambulatory evacuation is still being defined through different projects in the world depending upon the height and complexity of the facility. The most effective use of elevators for this type of evacuation is typically when the building as a whole needs to be evacuated. Should this be the case, through the use of the voice evacuation system, occupants would be instructed to meet on designated floors (by means of an exit stair) where elevators would pick occupants up and take them to the ground level. The elevators are on both normal and emergency power and are only used once the building and building systems affecting the elevators are deemed safe.

As an alternative to the prescriptive requirements of the building code, performance based solutions may also be utilized for numerous aspects of the required means of egress, including extended travel distances, and increased exit capacities. These solutions may include tenability analyses to determine the maximum amount of time occupants are provided with a tenable environment to exit the area under consideration. Timed egress analyses can then be computed to determine the maximum travel distances that occupants are permitted given this tenability analysis. Further, computer based models can also be utilized to determine if exit components can accommodate greater numbers of occupants, also based upon this tenability analysis. Of course, these solutions are also dependent upon the authority having jurisdiction being comfortable with the conclusions of these analyses.

Summary and conclusion

These Mega Resorts or high rise buildings can be overwhelming from a life safety aspect, especially the required means of egress systems. Breaking the facility down by levels and areas helps alleviate the prospect of having to exit an entire facility simultaneously, which can rival the size of small cities. It can be broken down into the same categories as above; high rise levels, garage, and podium. From there, each level may need to be further broken down and evaluated. Parking garages are usually the lesser challenging aspect of the facility followed by typical residential levels. However, the more challenging residential levels with larger guest suites or the upper levels containing high density occupancies (night clubs, pool decks, restaurants) as well as the podium levels will need to apply several of the solutions listed above.

Mega Resorts and high rises are the norm as desired destinations throughout the United States and the world. Exiting from these facilities is extremely challenging when dealing with so many factors, while trying to keep the design intent of the owner and architects in mind. Since floor space is at a premium, cost on the high density floors, creative solutions to exiting are almost always required. Through the use of multiple stairs/exits, scissor stairs, horizontal exits, separate evacuation zones, interior stair transfers, area of refuge floors, and elevator evacuation, these buildings can be designed efficiently to provide both entertainment and safe evacuation for those patrons. The ultimate design is to make the required exits augment the architectural design.

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Fire Department Instructors' Conference (FDIC Bahrain)

9-13 December 2007, Manama, Kingdom of Bahrain

The week of December 9 will find the best minds in fire protection and emergency response personnel from across the Gulf States gathered in Bahrain to share, discuss and practice their unique life saving skills. The event that draws such critical people is FDIC BAHRAIN 2007, the acronym FDIC stands for the Fire Department Instructors' Conference.

This event is in its second year and is the organized by a collaborative effort between the Bahraini Civil Defense fire-fighting and emergency response officers and a collection of international fire-fighting authorities. Co-organized by Pennwell, the FDIC team return this year with former UN Fire Chief Robert Trizzoi and fire-fighting legend John O'Connell, this time orchestrating an even more unique and deeply talented conference program.

The goal of FDIC is share methods, lessons learned and to create relationships which are beyond doubt unique to the fire service community. The concept of FDIC Bahrain is for fire professionals to teach one another then go out teach again to their fire-fighting forces back in their home communities or our industrial settings.



Community is not just a byproduct of being involved in fire-fighting it also an essential skill for those who must lead these critical forces. Being involved in the community of the world's fire-fighters helps the leaders to sculpt the best possible practices for the region or the industry they protect. This is in fact the most diverse collection of international industrial and municipal fire-fighters in the world.

This vital interaction of the worlds leading fire-fighting minds is made possible by the generosity and support of the Kingdom of Bahrain. The leadership in Bahrain appreciates the challenges and difficulties facing Bahraini fire-fighters and so facing the entire Kingdom of Bahrain and beyond.

Bahrain is experiencing tremendous growth and prosperity, combined with its rich cultural heritage it is a perfect example of the beauty and future, which has developed in the gulf region. It also provides the complete backdrop to discuss the many emerging issues which face the regions structural and industrial fire-fighters. The interaction between structural fire-fighters and industrial brigades, between municipal civil defense fire-fighters and shipboard fire-fighters, between civil defense forces and fire-fighters operating at natural disasters and acts of terrorism is continually growing and evolving. Due to the Kingdom's tireless efforts and it's partners in FDIC all of these topics and many more will analyzed, queried and for the participants more fully understood.

FDIC 2007 has attracted the very best minds the industrial fire-fighting world to include Mr. Frank Bateman of National Foam Corporation, a leading authority not only in industrial fire-fighting but in fire-fighting instruction. Mr. Bateman will be providing field training on critical flange fires, open fires and other technical indus-





trial operations. At any fire service conference one would expect a leading expert to be showcased but at FDIC Bahrain both the worlds industrial fire-fighting giants are teaching, Mr. Dwight Williams a living legend, world renowned innovator and one of the world most respected industrial fire-fighting experts along with his team from Williams Fire and Hazard Control will also be conducting live training. An industrial fire-fighter from the Gulf can participate in



a live training exercise on one day with Mr. Frank Bateman and the following day with Mr. Dwight Williams. This is a once in lifetime unique experience, the ultimate industrial fire-fighting training experience available only in the pure training environment of FDIC Bahrain 2007.

The structural municipal fire-fighters of the region also have the world best to learn from as well. Leading world-class teams for live hands on training are

Francesco Rossetti presenting Vehicle Extrication, Gianmario Gneccchi presenting Fires Below Grade, Simon Rogers directing High Angle Rescue, Chris Ruberry delivering Marine Fire-fighting and Sean Nelson presenting High-Rise Fire-fighting.

The FDIC 2007 Bahrain conference has two days highly dynamic workshops and three days of intensely focused classes for the command and control staff officers by the most recognized international authorities alive. Every Fire Service leader in the region is expected to be in Bahrain in December listening, sharing and experiencing this unparalleled opportunity. The list of presenters is a virtually who's who of fire service luminaries who have come together for the very first time in Bahrain.

FDIC 2007 also offers an exhibition that will showcase the latest equipment, products and services that enable the fire-fighters to do their job. Many of the world's leading suppliers to the fire industry will be present at FDIC, demonstrating their leading products and services, to this specialist and professional industry.

Only the significance of the region and the opportunity to influence the development of the world very best fire-fighters could have brought these leaders together.

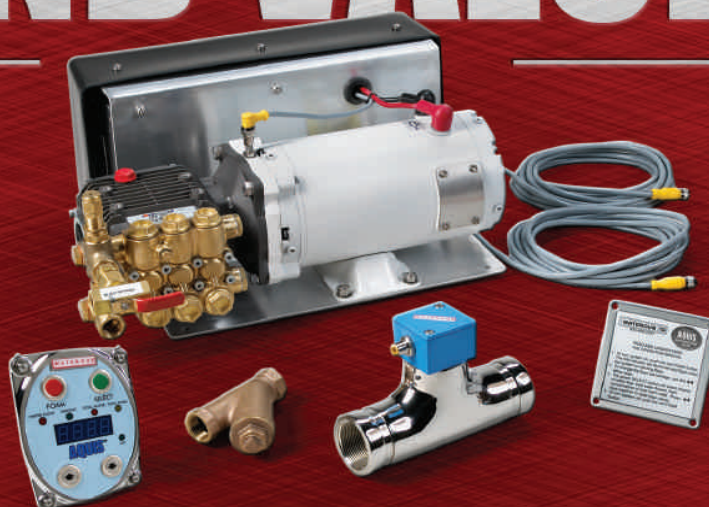
For a complete listing of classes, exhibitors and registration information go to www.fdicbahrain.com



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International Fire Fighter is proud to be the official and exclusive international journal for FDIC Bahrain as well the FDIC in Indianapolis. On the next few pages, we look at what some of the exhibitors in Bahrain will be showing.



Akron Brass Introduces Several New Products

From their Weldon division, AKRON BRASS has introduced several new features with their multiplex electrical system (V-MUX). This includes a USB direct download component with their Vista III display, more intuitive diagnostics output naming, and GPS integration with the Vista III display as well.

Another new Weldon division product is a series of LED warning lights – the Diamondback™. Engineered with patented high-power V-LED technology, these new lamps have Pure-Pattern optics, customizable color arrangements, highly flexible flash patterns, lamp synchronization, wireless pattern selection, and they are field serviceable and upgradeable.

Akron Brass has also introduced enhanced TurboJet and Assault handline nozzles. These changes include making the products easier to disassemble and repair, easier pattern identification, and reduced rotation by as much as 50% when changing from fog to straight stream.

Other products being displayed at FDIC Bahrain 2007 include monitors, such as the MercuryMaster 1000, the Brass Omega XP and the FireFox, cord and hose reels, as well as scene and vehicular lighting.

Founded in 1918, Akron Brass is a Premier Farnell company and is ISO 9001: 2000 registered.

Visit us at FDIC Bahrain Hall 4 Booth G8.



The CE Atlantair range of Self Contained Breathing Apparatus (SCBA) is AVON PROTECTION SYSTEM's most recent development offering true operational flexibility for fire-fighting and HAZMAT units. Atlantair

also meets the growing demand for an SCBA capability from specialist and paramilitary forces, explosive ordnance disposal (EOD) units, as well as naval and air force fire fighting units. The Atlantair range marks Avon's entry into the SCBA market outside the USA, where it has a leading position in SCBA technology through AVON-ISI. The Atlantair SCBA technology enables Avon to offer a broad capability in respiratory protection, which gives users exceptional operational flexibility when dealing with extreme CBRN threats.

The FM12, which is in service throughout the world and is the current approved respirator for UK Police in combination with the CR1 suit.

The 50 series of respirators including the:

- C50 general service mask which is approved against CE and NIOSH standards for use in a CBRN environment.
- FM53 multi purpose respirator capable of SCBA, PAPR and APR applications.
- EH20 personal emergency hood which provides an alternative to the traditional CBRN general service respirator. Developed specifically for the UK emergency services the CE approved EH20 provides a high level of respiratory protection from principal CBRN agents for at least 20 minutes allowing time to evacuate from a contaminated area.

The ST53, multi-capable RPE system which has been developed to provide the user with the capability to select either positive pressure SCBA or negative pressure filtered air during use, enabling the user to select the level of protection demanded by a changing threat without having to leave the incident or change RPE systems.

Avon Protection Systems, is the acknowledged world leading provider of advanced CBRN respiratory protection solutions to the world's military, law enforcement, first responder, emergency services and industrial markets.

Please visit us at our booth K23.

Avon Protection Systems
Hampton Park West
Semington Road
Melksham SN12 6NB, UK
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most extensive line of emergency response apparatus manufactured today – with all your specific requirements in mind. Vehicle types include: quick attack units, pumpers, tankers, rescues, hazmats, command units and specialized vehicles, industrial vehicles, aerial ladders and platforms, and aircraft rescue firefighting vehicles. E-ONE manufactures the following brand names: E-ONE, E-ONE Classic Series, American Eagle, Tradition Series, Bronto, and Saulsbury. When lives are in the balance and seconds count, we must question everything. E-ONE.

Please visit us at our booth E6.

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The FIRE SAFETY ENGINEERING COLLEGE is located in the beautiful capital city of Muscat in the Sultanate of Oman within easy reach of Seeb International Airport. The College is a unique Higher Education Institution in the Sultanate of Oman founded in 1997. The College is licensed by the Ministry of Higher Education in Oman and affiliated to the University of Central Lancashire, UK.

Five new courses have been approved by the University of Central Lancashire (UK) and the Ministry of Higher Education, Sultanate of Oman, to run at the Fire Safety Engineering College and the University from September 2007.

The first three years of the courses are studied at the Fire Safety Engineering College and lead to Bachelor Degree* qualifications.

- BSc Well Engineering
- BSc Health, Safety & Environmental Management
- BSc Fire Safety (Engineering)
- BSc Fire Safety (Management)
- BSc Facilities Management

Students who complete the three years successfully may progress to a fourth year at the UK University to complete an Honours Degree**.

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- Health, Safety and Environmental Management

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- Well Engineering
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*Bachelor Degree (University of Central Lancashire UK) = Advanced Diploma (Oman)

**Bachelor Degree with Honours (University of Central Lancashire UK) = Bachelor Degree (Oman)

The College courses replace the 2-year Diploma courses but students may still qualify for the Diploma after 2 years of study.

The higher education programmes attract both young and mature students from many different countries in the

region, and students on these programmes have the opportunity of mixing with experienced industry professionals attending short courses at the College.

The College also provides Vocational courses in:

- Aviation and Civil Defence
- Fire and Rescue
- Fire Engineering
- Risk and Safety Management
- Well Engineering

Many of our courses are internationally accredited and directly relevant to industry and to employment. The record of students going into good employment is excellent and the feedback we receive from employers is highly appreciated.

The College is a voting member of both

the Certificate (vocational) and Degree Assemblies of the International Fire Service Accreditation Congress (IFSAC) USA, and has accreditation for certification for many Fire Safety courses. It is also an associate member of the International Well Control Forum (IWCF), an associate member of the International Association of Drilling Contractors (IADC) and a training center for the American Safety and Health Institute (ASHI) Basic Life Support training. The UK Civil Aviation Authority undertake an annual audit of the Fire Safety Engineering College in order to assess it against standards that have been established in the UK, with particular reference to 'CAP 699'.

The College has an excellent reputation in the Middle East, built upon the superb facilities and highly professional and dedicated staff.

Visit us at our booth H2.

For more information, please contact:
Mr. Mohammed Hettini
 General Manager – Marketing & Business Development
 Fire Safety Engineering College – Oman
 PO Box 2511
 Postal Code 111 Seeb
 Sultanate of Oman
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FOAMPRO, the industry leader in foam technology offers a wide variety of easy to use, fully automatic, direct injection proportioning systems. Various sizes from 3.8l/min through 1136l/min are available to meet your specific Class A and B foam applications per DIN V 14430. Common usage include: Municipal, Bush/Wildland; Industrial, Compressed Air Foam Systems (CAFS), Marine and ARFF.

Please visit us at our booth K18.





At its stand during FDIC Bahrain 2007, MSA again will be presenting numerous of its latest innovations, interesting developments and proven products in the area of sophisticated safety products and gas detection system solutions.

Among others the following products are presented, explained and demonstrated:

- **FireHawk M7: MSA's Next-Generation Breathing Apparatus for Firefighters**
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- **AirGo: Modular Industrial SCBA System**
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- **alphaHUD Head-Up-Display**
(Hands-free Monitoring of SCBA Air Supply & Alarms)
- **motionSCOUT**
(Next Generation Stand-alone Personal Alert Safety System)
- **The Thermal Imaging Camera EVOLUTION**
(For Every Application the Optimal TIC Model)
- **The new Fuego Fire Helmet**
(For cost effective high level of protection fire fighting head protection)

Please visit us at our booth H32.

SCI Structural Composites Industries

STRUCTURAL COMPOSITES INDUSTRIES (SCI) is the pioneer of manufacturing composite SCBA cylinders. Based in Pomona, California (USA), SCI has a state-of-the-art, vertically integrated manufacturing facility which allows SCI to produce low-cost, top quality composite cylinders. SCI has been building composite cylinders for over 35 years. With over 2 million cylinders sold, SCI has never had a field failure, an unparalleled record!

SCI produces a full range of SCBA cylinders with DOT/TC (North America), CE/HSE (European) approvals as well as for the Japanese, Chinese, Korean, Australian and Russian certifications. SCI is the recognized leader in most of these areas for the highest quality standards as well as high economic value.

SCI has recently developed the first Non-Limited Life and 30-year life aluminum lined cylinders with CE approvals. This allows the added safety of a seamless aluminum liner (Type 3) with longer life value.

Additionally, SCI is now introducing the first composite cascade tank for refilling SCBA's as well as for many high pressure foam applications. The new tank has a 5,000 PSI (350 Bar) working pressure capacity.

SCI offers a wide range of valves for the non-metric thread port designs, commonly used in the US, Canada and many parts of the Middle East.

In addition to our SCBA cylinders, SCI is a major manufacturer of Natural Gas and Hydrogen composite tanks for vehicles as well as a large range of pressure vessels for aircraft, military and space applications.

Structural Composites Industries will be exhibiting their line of Fire Fighting cylinders including the newly introduced products at FDIC Bahrain at Stand J33.

You can also learn more about SCI and the products they manufacture at www.scicomposites.com, or contact in the US William Clinkscales at wclinkscales@harsco.com, or in Europe Edward Sands at esands@harsco.com



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SOUTHCOMBE

The 'Cadillac' of fire gloves arrives at FDIC Bahrain

Described by one impressed fire fighter as the 'Cadillac' of fire gloves, FireMaster Ultra® by SOUTHCOMBE BROTHERS will be available to view and buy at Booth B16, FDIC Bahrain, 11-13 December 2007.

The FireMaster Ultra® gloves are made with premium, high-end materials at every stage. Designed for supreme heat and cut resistance but still dextrous and lightweight, fire houses across the world have been clamouring for test samples.

Made from Pyrohide® fire-resistant grain leather, unique to Southcombe Brothers, the gloves will not crack or warp under extreme heat conditions. And this amazing leather is not just fire-resistant, it will repel chemicals, liquids and heat – then dries soft and supple. Now supplying over 80% of UK Fire Brigades, Southcombe Brothers, the specialist glove manufacturer, is proud to announce that the FireMaster Ultra® is fully NFPA 1971-2007 certified.

The gloves also use a Gore Crosstech™ membrane, Kevlar™ palm and finger patches, Kevlar™ blended linings, Kevlar™/Nomex™ cuffing (on wristlet models only) and are stitched throughout with Nomex™ thread.

Come and meet Southcombe Brothers and try the FireMaster Ultra® and other revolutionary hand protection products at **Booth B16**, FDIC Bahrain, 11-13 December 2007. Or visit them at www.southcombe.com.

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TFT champions industrial firefighting equipment world

FDIC Bahrain – Question: Where can the world's finest firefighters handle the world's best firefighting equipment? Answer: Only at Task Force Tips' (TFT) FDIC Bahrain booth.

TFT, the U.S. based international firefighting equipment manufacturer, is showcasing



many of the innovative industrial products that packed its booth at FDIC Indianapolis (the U.S.'s largest annual firefighting show). Whether looking for patented easy on/easy off large diameter suction hose (that doesn't leak), the industry's favorite inline eductor, or an all-in-one patented portable foam system that allows one firefighter to make 56,775 litres of foam in 21 minutes – TFT offers it.

Monitors? Nothing beats TFT's portable Blitzfire oscillating monitor with Automatic Shut Off Valve. Stake it, set it, and flow up to 2,000 LPM, sweeping 10, 15, or 20 degrees either side of center. Bigger? The Protector 4,500 LPM fixed station monitor, with 360° rotational ability, sports a patented, direct waterway that wipes out most friction loss. Bigger yet? Try the remote controlled power of 5,700 LPM with the new Typhoon Monitor RC. Or go full force with the 7,600 LPM of Monsoon. High Flow. Low friction loss. Optional remote controls.

Nozzles? The QuadraFog is an economical, lightweight, selectable gallonage 20-150 LPM (25 mm) or 110-470 LPM (38mm) favorite. Its counterpart, the ThunderFog, delivers 110-750 or 360-950 LPM (38mm) of NFPA compliant power. Automatic? The MidMatic delivers 260-760 LPM NFPA compliant force. Dual Pressure? NFPA compliant Mid-Force weighs in with a 260-760 LPM punch. All have optional foam jet attachments.

More? Come visit TFT's booth J31.

Contact: Larry King
TFT VP International Sales
Tel: 219-548-4000
Email: lak@tft.com



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to talk about our complete line of advanced fire suppression tools, which include:

HL200/300

Specifically designed for international-style fire vehicles, the compact, rear-mounted simultaneous High/Low pressure series pumps feature built-in high-pressure relief valves for enhanced safety. Both models are backed by an industry exclusive 5-year warranty.

E604

The E604 Motor Pump brings together the performance of a Waterous fire pump and the power of a Folan V 290 2-cylinder, 4-cycle, liquid-cooled, engine. The E600 series is designed to EN14466:2005 specification. Its 30-liter capacity fuel tank delivers 3-plus hours of operation.

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Advantus is the first and only foam management system that employs four specialized sensors; two featuring advanced conductivity-based technology, one to measure flow and one to monitor water temperature. This gives Advantus the unique ability to continually monitor the foam/water ratio and make automatic adjustments on-the-fly for optimum foam effectiveness with the least amount of foam concentrate waste.

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The right tool at the right price for the right situation. Aquis is our scaled back version of Advantus. While it does not offer the same capabilities, Aquis holds its own and stands out versus the competition. Featuring a Comet positive displacement pump, microprocessor control head and Class A foam capabilities; Aquis brings reliable foam management to your apparatus.

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CAFS changes the way fires are attacked, how quickly they can be extinguished and limits the damage fires can inflict. No one understands this better than Waterous. We've led the charge in CAFS deployment by developing the most advanced CAFS in the industry.

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The Waterous CX pump is for those in need of a tough, all-around, yet easy-to-use single-stage end-suction pump easily mounted on vehicles in need of midship units. And because the CX is powered by a PTO drive, it can also be front-mounted or direct-driven. The CX features an industry exclusive flame-plated impeller and is backed by a category leading five-year warranty.

Fight the fire safer!



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Industrial protection whenever temperatures are significantly increased (250C, 30 min)



Full Exhibitor List

Company Name	Booth Number	Company Name	Booth Number
ACS Firehouse Software	H8	MDM Publishing Ltd	C12
AFI-ALAA for Industry	J16	MEFP – Middle East Fire Protection	J7
Air Technology Solutions Inc	F36	Milestones Switchgears Pvt. Ltd.	1123
Akron Brass Co	G8	Mohammed Jalal & Sons W.L.L & Bronto Skylift	E2
Aljazeera Industrial Services	F22	MSA Middle East	H32
Alpha Fire Services WWL	C17	NAFFCO	G22
Amkus Rescue Systems	D11	National Foam	F6
Arab Shipbuilding & Repair Yard Co. (ASRY)	B10	National Occupational Safety & Health Center	D18
Arabian East Training Centre	G6	PAB – Plastika Akrapovic Buzet	D27
Avon Protection	K23	PAN GULF Fire Protection & Safety Co	G6
Bapco	J36	Paratech Inc	E40
Bauer Kompressoren Middle East	C16	Pentair Water Middle East	K18
Bhatia & Company (Bahrain) – Banz Group	B24	Pierce Manufacturing Inc	K27
Blazemaster CPVC Fire Protection Systems	G36	PSL	B18
Bodycote Testing Group Middle East	D9	ROC International	J22
Bristol Uniforms Ltd	H1	RRC Middle East Ltd – Part of Rapid Result Collage	K1
Brunswick Comm & Gov Products	K28	Saudi Aramco – Fire Protection Department	K14
Cutters Edge Fire Rescue Saws	G2	Scott Health & Safety Ltd	G14
Da Miano and Graham, Ltd	G35	Shaheen Group – Gulf Services	D6
E-ONE Inc	E6	Southcombe Brothers Ltd	B16
E2V Technologies Ltd	C28	SPERIAN	H38
Ferrara Fire Apparatus Inc	H14	Structural Composites Industries (SCI)	J33
Flowtronix Ltd (FT)	H7	Task Force Tips	J31
Foam Pro/ Hypro	K18	Ten Cate Protect	H6
GFT General FireTech GmbH	K25	Texas Engineering Extension Service	C15
Gimaex	H22	The Fire Safety Engineering College	H2
Industrial Fire Journal/Fire & Rescue Magazine	K32	Tyco Fire & Security	F14
Industrial Scientific Corporation	D2	UNR Fire Science Academy	C10
Interfron SpA	C25	W S Darley & Co	K24
Khayber Trading Company W.L.L	D12	Waterous Company	H5
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Pic courtesy of Dyne Technologies



Testing Fire Fighting Foam Used in Marine Applications

By Joan M. Leedy

President of Dyne Technologies

Most fire fighting foam users including marine applications fall under some governing body that requires – or at least recommends – the user test the foam on a regular basis to ensure foam quality.

One example of these codes is the National Fire Protection Association Standard on Foam (NFPA 11) which recommends annual testing. The NFPA 11, 2005 edition, entitled “Low-Medium-, and High-Expansion Foam” reads as follows:

“At least annually, an inspection shall be made of the foam concentrates and their tanks or storage containers for evidence of excessive sludging or deterioration. Samples of concentrates shall be sent to the manufacturer or qualified laboratory for quality condition testing.”

Chapter 9 of NFPA 11 is exclusive to recommendations for Low-Expansion Foam Systems for Marine Applications. The testing and inspection recommendation in the Marine chapter refers the user back to the NFPA statement above.

Furthermore, NFPA 11 states:

“The inspection shall include performance evaluation of the foam concentrate or premix solution or both. Tests that deviate more than 10 percent from those recorded in acceptance testing shall be discussed immediately with the manufacturer.”

Other testing procedures covering marine testing include the International Maritime Organization MSC/Circ. 582 – the standard governing oil tankers and the United States Coast Guard, Department of Homeland Security 46CFR Shipping, subchapter D – Tank Vessels 31.10-18 Inspection and Certification, Firefighting equipment.

Similar to NFPA, the USCG requires periodic testing of foam be completed annually. The IMO specification requires foam be tested 3 years after installation and then annually thereafter.

Table 1 – Periodic Testing Requirements for Marine Applications

	National Fire Protection Association Standard on Foam NFPA 11	United States Coast Guard 49 CFR	International Marine Organization
Frequency	Annually	Annually	Three Years after Installation and Annually Thereafter
Tests Required	Quality Condition Testing	"specific gravity, pH, percentage of water dilution, solid content and certification as a suitable firefighting foam"	Sedimentation – <0.25% pH Value – 6.0 – 9.5 Volumic mass, expansion, 25% drain time – within acceptable range of type approval.
Water	Not Specified	Not Specified	Sea Water

Table 1 compares the periodic testing required by these three specifications. Of these three the IMO specification specifically states the tests required and the test result requirements. NFPA 11 and the USCG require the manufacturer or testing laboratory to set the testing and pass/fail criteria. In addition, the IMO specification requires the foam concentrate to be stored for 24 hours at a temperature of 60°C (140°F) prior to running the sedimentation, expansion and drain time test.

Typically testing laboratories will perform a series of tests including both physical properties tests on the concentrate as well as performance

tests on the foam solution. The following is a list of physical property tests that might be run on a foam concentrate sample.

The refractive index of a liquid is a measure of how much the speed of light is reduced as it travels through the liquid. The refractive index measurement can indicate whether the foam concentrate has been diluted or contaminated. The refractive index is typically measured on synthetic foam concentrates. It generally is ineffective on protein foam concentrates because of the high solids content.

The sedimentation test is run to ensure a



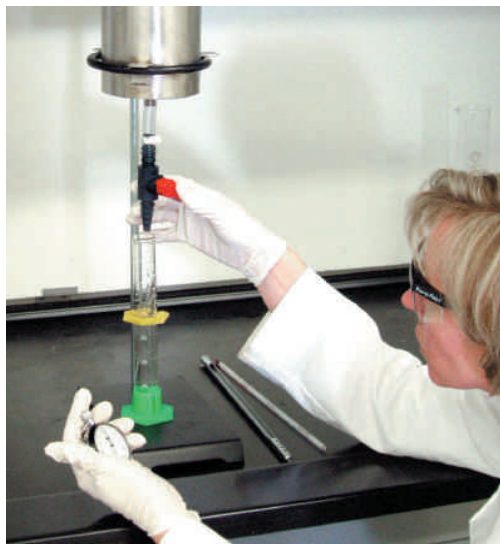
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BP ADVOCATE
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Pic courtesy of Dyne Technologies

minimal amount of sediment in the foam concentrate. The sediment level is determined by spinning the sample in a centrifuge for a specified amount of time. After spinning, the sediment collected at the bottom of the centrifuge tube can be examined and measured. The percent sediment by volume can be calculated. Excessive sediment can be a sign of contamination and/or deterioration.

Viscosity is a measurement that quantifies a fluid's resistance to flow. A maximum viscosity level can ensure a foam concentrate will flow successfully through a foam proportioning system. An increase in viscosity can render the foam ineffective simply because it will not flow through the proportioning system and mix with the water.

pH is a measure of the acidity or alkalinity of a solution. The pH is measured for two reasons. A neutral pH of 6 to 9.5 ensures the product will not corrode the piping and tank in which it is stored. Furthermore, a neutral pH may be required to keep the foam ingredients mixed and in solution. A pH outside of this range can cause an ingredient to drop out of solution. For example, often times a foam with a low pH, below 6, will also show a low expansion because the chemicals in the foam that cause foaming are adversely affected by this low pH level.

The volumic mass can also be referred to as the



Pic courtesy of Dyne Technologies

specific gravity or density. The density is the weight of a given volume of a liquid. For a foam concentrate with a density higher than the system water, a decrease in the density can be a sign of inadvertent dilution of the concentrate with water. The concentrate density will vary depending on the type and nominal concentration of the product. A typical density for a protein-based 3% foam concentrate is 1.158 grams per milliliter while a 3% aqueous film-forming foam concentrate would more likely be 1.030 grams per milliliter. Figure 1 is an example of how the density might change as a foam concentrate is diluted with the system water. Because sea water has a higher density (approximately 1.027 grams per milliliter) than fresh water (1.00 grams per milliliter), the system water must also be considered when analyzing the change in density of a concentrate over time. Note in the example in Figure 1 that density of the AFFF does not change significantly



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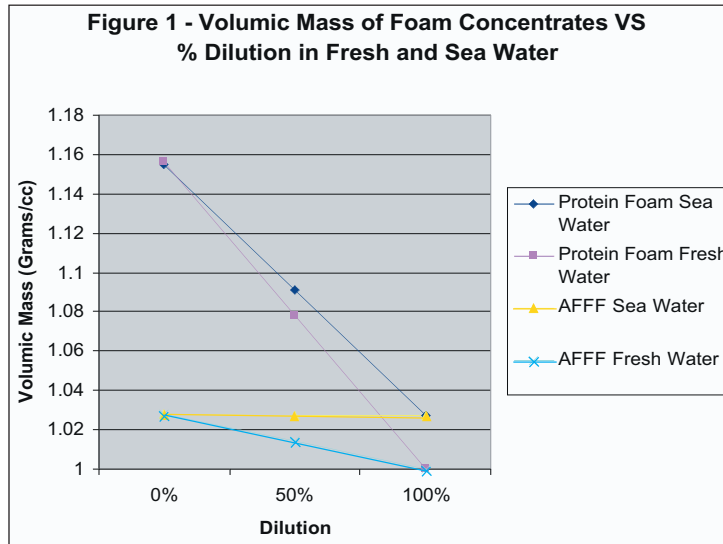
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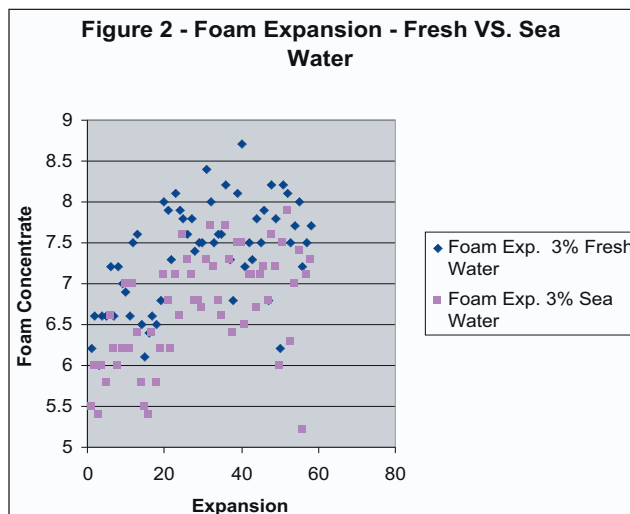




as it is diluted with sea water because the density of the AFFF and the sea water are very similar.

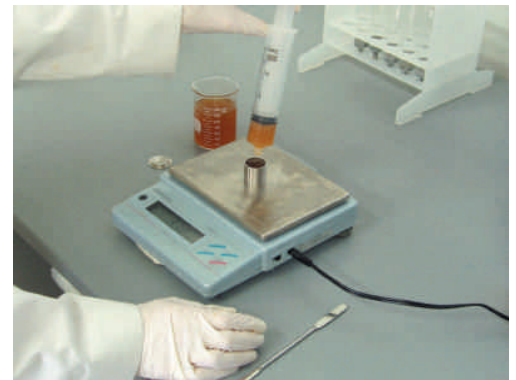
While the tests discussed so far are all physical property tests completed on the foam concentrate, the remaining tests are all performance tests run on the foam solution after it is mixed with water. In order to run the performance tests, the foam concentrate must be diluted with water at the appropriate concentration. A 3% foam concentrate must be diluted 3 parts foam concentrate to 97 parts water, while a 6% foam concentrate is diluted 6 parts foam concentrate to 94 parts water. The IMO specification requires that the foam concentrate be mixed with sea water not fresh water.

Surface tension, interfacial tension and spreading coefficient are measured to determine whether or not a foam is a film-forming foam. A positive spreading coefficient ensures the foam is a film forming fluoroprotein or aqueous film forming foam. Though not required to effectively extinguish a fire, the fire fighting capability of foam may be enhanced by its ability to form a thin water film on the surface of a non-water soluble flammable liquid.



The foam expansion is often used to characterize foam and to measure its performance. The expansion ratio is the weight ratio a given volume of foam solution to that same volume of expanded foam. For example, 1600 milliliters of fresh-water foam solution, prior to being expanded will weigh approximately 1600 grams. Once the foam is expanded this same volume of foam may weigh only 200 grams. The expansion in this example would be 1600 divided by 200 grams or 8:1. The expansion ratio does depend on many variables including water temperature, nozzle pressure and nozzle configuration. In

addition, the type of water used will affect expansion. Figure 3 shows the expansion ratio of 58 different foam concentrates measured both with fresh water and with sea water. Of these 58



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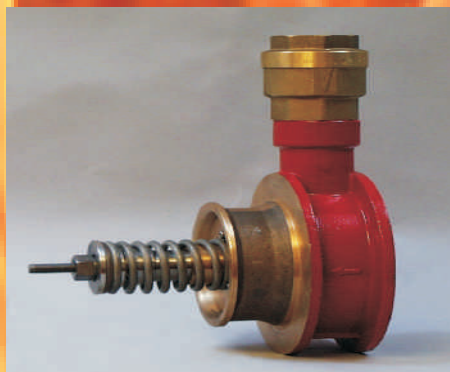
measurements, the sea water expansion was 0.66 expansion units or 8.9% less than the fresh water expansion.

The 25% drain time is a measurement of how much time it takes for 25% of the weight of a given amount of foam to drain back into a foam solution. This property is important because once foam drains into a solution it is no longer providing any fire extinguishing capabilities nor can it secure a spill from ignition. As with foam expansion, salt water can also reduce the 25% drain time of a foam solution. Figure 3 shows the drain time value of these same 58 foam concentrates when mixed with both fresh and sea water. On average, the drain time was 41 seconds or 9.2% faster when the foam concentrate was mixed with sea water than with fresh water.

Because typical marine applications use sea water and not fresh water for foam dilution and generation, it can be important in these



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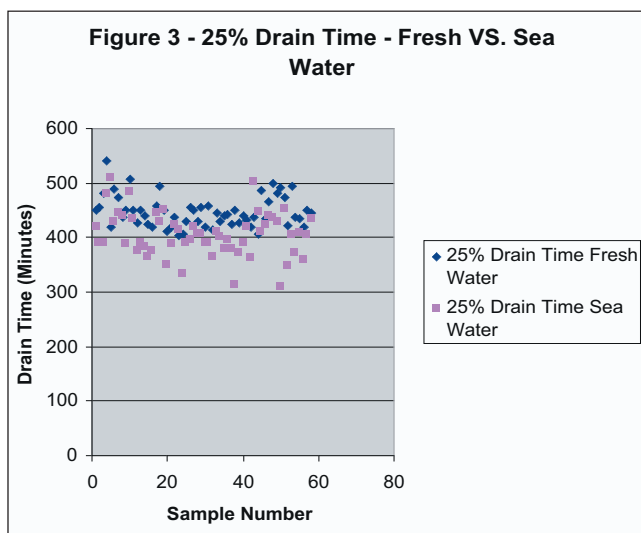
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applications to test the foam with sea water. Though the expansion and drain time of all foams may not be adversely affected by salt water, many are. By testing the concentrate with the water used in the application – fresh or sea – performance during a crisis situation is better assured.

In addition to periodic testing of foam stored on-board ship, specifications often require the foam be "Type Tested" prior to being used for a marine application. Type testing would require the foam manufacturer to have the brand and type of foam tested by an independent testing agency prior to use and is typically valid as long as the formulation or specification have not changed. All three marine standards – NFPA, USCG and IMO require that a foam concentrate initially complete and pass a testing protocol (type testing) prior to use on board ship.

Table 2 outlines the type test requirements for each of these specifications. The USCG and NFPA tests are the same. All three specifications require similar fire tests. The major difference in the IMO

specification is that it requires a positive spreading coefficient thus limiting use to film forming foams. It is also important to point out that the USCG does not simply approve foams but a foam system. Thus the foam quality of the small scale fire test nozzle must match the foam quality of the full scale equipment and an additional component of the specification would be ensuring the foam will proportioning correctly through the equipment. Also worth noting is the USCG specification requires a foam to initially be listed by Underwriters Laboratory through the specification UL 162. UL 162 is a complete specification in and of itself and includes requirements for foam quality, fire tests, and storage tests in addition to other test requirements.

This paper discusses only three specifications that apply to marine

applications – NFPA, USCG and IMO. Other specifications may apply depending on the jurisdiction. All of these specifications are designed to ensure the foam used on board ships will perform effectively. To ensure safety, consider the following:

- Fully assess the hazard on board and make sure the foam is designed to handle the hazard i.e., if polar solvents are on board, purchase a polar solvent foam.
- Purchase foam that will meet the applicable specifications and make sure the foam has been tested by an independent testing agency.
- Request a certificate of analysis from the manufacturer for the lot of foam purchased. If available the C of A will provide a baseline for many of the physical and performance properties.
- Test the foam when it is first installed to make sure the system will proportion it properly.
- Complete periodic testing of the foam system and the foam concentrate.
- Maintain records of all testing completed to monitor changes and trends.

IFF

Table 2 – Type Testing Requirements for Marine Applications

	NFPA and USCG 49	IMO
Tests On Foam Concentrate	None	Freeze Thawing Heat Stability Sedimentation Kinematic Viscosity pH Volumic Mass
Tests On Foam Solution	Expansion 25% Drain Time Both Fresh and Sea Water	Spreading Coefficient >0 Expansion 25% Drain Time All Mixed with Sea Water
Fire Tests	9.29m ² (100 ft ²) Gasoline Two Sea Water Two Fresh Water	9.29m ² (100 ft ²) Gasoline Fire Sea Water
Additional Requirements	Listed by Underwriters Laboratory	None
Polar Solvents	For Use on Polar Solvents – Foam Concentrate must pass applicable UL 162 Fire Tests (50 ft ²)	Polar Solvent Use Not Mentioned

Joan M. Leedy is President of Dyne Technologies – ISO 9000:2001 compliance testing laboratory
Member of the NFPA Committee on Foam Standards Technical Panel
Member for Foam at Underwriters Laboratory



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Angus Water Spray System. Pic courtesy of Angus Fire



Fires in Tanks of Hydrocarbons



By **J. C. Jones**

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We are still not very far in time from the Buncefield accident, which was a subject of a previous article in this periodical.¹ The present article deals with selected aspects of fires in tanks of flammable liquids and starts with a fairly recent case study, that at Glenpool Oklahoma in 2003 storage where an ignition source is believed to have been provided by static electricity. The behaviour of such liquids once ignited, after extinguishment procedures have begun, will then be discussed and again use will be made of case studies.

Electrostatic effects as an ignition source

At Glenpool a tank previously having held gasoline was being filled with diesel. Guidelines apply when such a change is taking place, and these include avoidance of splashing and of excessive flow speeds or other mechanically vigorous operations which could lead to the creation of charge. What might have happened at Glenpool is that charge was created in the diesel which ignited residual vapours from the gasoline previously contained in the tank.

Though none is a 'conductor of electricity' in the conventional sense, petroleum fractions do differ significantly from each other in their electrical conductivities and this is a factor in handling and storage safety as static electricity can provide an ignition source as happened at Glenpool. There are two ways in which such effects can be prevented. One is to raise the conductivity of the

fuel itself by incorporating a fuel conductivity improver, aka. a static dissipater additive, thereby enabling accidentally created static electricity to be dispersed and avoiding creation of a spark. This is common for aircraft turbine fuels (ATF). When crude oil is refined sulphur concentrates in the higher boiling fractions. Diesel has the highest boiling range of all the atmospheric distillates and so tends to be high in sulphur. The sulphur content can be reduced by hydrotreating fairly straightforwardly, but such treatment tends to reduce the electrical conductivity thereby exacerbating the static electricity hazard. A fuel conductivity improver is in such circumstances necessitated. One such having found application to hydrotreated diesel has amongst its ingredients dodecylbenzenesulphonic acid and an amine polymer.

An alternative or complementary approach to the use of a fuel conductivity improver is the use

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of anti-static paints. Such a paint on the inside of a tank will ensure that any incipient electrical charge there is conducted away so that spark formation is precluded. The term 'static dissipative' is sometimes applied to anti-static paints. Anti-static paints are often epoxy based. Some anti-static paints are for use not in storage vessels but for walls and ceilings where hydrocarbon vapour hazards exist and these too can be epoxy based. Where walls and floors are coated with anti-static paint earthing is necessary and this might take place naturally through the building structure if there are steel supports, otherwise intentional connection to earth will be necessary as part of the protection process.

Boilover, frothover and slopover

Once a fire has begun in a tank of flammable liquid fire fighting can be made more difficult by these effects. Boilover is the result of instability within the liquid brought about by contaminant water which, being denser than the fuel, will be at the base of a storage vessel. Nucleate boiling (as opposed to film boiling) of water occurs when the temperature is above the boiling point of water but below that of the organic phase with which it is in contact which therefore acts as a heater surface. A stage is reached where all such water evaporates and becomes superheated. The effect of the vapour on exiting the liquid is similar to that of placing a stirrer in the liquid, enhancement of burning rate and possible loss of containment so that the liquid fire is extended to sites outside the vessel. In August 1983 there was a refinery fire in Milford Haven, Wales, in which boilover occurred to a dramatic degree. The fire began in a tank containing crude oil. The tank had an internal floating roof which some hours into the fire broke up and sank. Later boilover occurred and some of the oil exiting the tank as a result ascended to heights of hundreds of meters. It therefore spread widely on descent, and the fire which ensued occupied an estimated 1.5 hectare. Fire fighters had set up a water curtain around the tank which was on fire. This technique uses an aqueous spray issuing from a nozzle at a wide angle. Fire fighting nozzles are available which provide for such water release or for a straight stream depending on adjustment.

An earlier case study involving boilover which

has gained some notice and attention amongst experts is that at Niigata, Japan in 1964. Crude oil at the refinery ignited during an earthquake, and boilover contributed to the involvement of other tanks of crude oil in the fire.

A milder effect that boilover having the same cause is spillage of liquid over the tank walls to the outside, known as frothover. A suitable foam can be directed at a tank fire displaying frothover. Aqueous film-forming foams (AFFF) have been so applied. Expansion of these for use can be enhanced by use of an aspirated nozzle. There was significant frothover at a fire involving crude oil fire in Newport OH in 1986 and this was controlled by application of foam. An alternative to foam is the digging of a temporary trench close to the tank or erection of a makeshift wall in order to prevent liquid having 'frothed out' from spreading.

It is possible for an effect akin to boilover to occur if extinguishment water enters a burning liquid. Water having so entered the tank will evaporate and the presence of the vapour destabilises the bulk fluid. Slopover is less vigorous than boilover and, as with frothover, control can often be achieved by the use of foams.

There are a number of other well documented cases of boilover and related effects in hydrocarbon liquid fires. For example, in Trieste Italy in 1972 there was sabotage of pipe work at a tank of crude oil at a refinery. The internal floating roof of the tank eventually failed (as happened at the Milford Haven accident previously described) and boilover resulted.



Angus Base Injection Foam System. Pic courtesy of Angus Fire

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Storage Tank Bund Protection System featuring Angus Niagara Medium Expansion Bund Pourer. Pic courtesy of Angus Fire



A further case study

This piece began with a discussion of an incident in Glenpool Oklahoma in 2003. Several operators have tanks at Glenpool and in 2006 there was an incident involving a tank having different ownership from that in the 2003 incident though positioned quite close to it. The affected tank in the 2006 fire was holding gasoline. There was no spread to nearby tanks. Removal of fuel from the tanks via pipes from it took place during the fire, and fuel was diverted either to other tanks at the site or to distant locations by pipeline. As well as mitigating the possible effects of the fire this had the benefit that most of the fuel in the tank was retrieved and financial losses thereby reduced.

Future fuels

Increasingly diesel is being replaced by biodiesel as carbon dioxide reduction targets are having to be met. Most biodiesels have better conductivities than mineral diesel and do not require a fuel conductivity improver. For any which might those which have been developed for mineral diesel are effective. Where biodiesel and mineral diesel are blended the biodiesel itself acts as a fuel conductivity improver. So the replacement of diesel with biodiesel appears to have the bonus of enhanced storage safety at least in terms of static electricity.

Nevertheless, as biodiesels have increased in importance they have not done so without mishap. At a biodiesel plant in Bakersfield CA in 2006 there

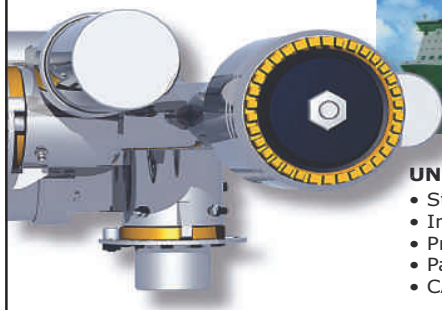
was a fire involving methanol. This is widely used as a reagent in biodiesel preparation, as esterification with methanol is a means of raising the cetane number of a biodiesel. The cause of ignition is believed to have been static electricity as in the 2003 Glenpool accident. There was total destruction of the building. Much of the chemical inventory – methanol and unprocessed biodiesel – was in railcars at the plant at the time the fire began so it was possible to move it to safety. In the same year there was a fire involving biodiesel in Salem Oregon. The fire occurred in a barn where a small business manufacturing and storing biodiesel for sale to rural consumers was based. Biodiesel had been stored in small containers and there was also methanol for use as a reagent. On being sent to the fire the fire fighters thought that on arrival they would simply be extinguishing a blaze at a barn. Once there they found a fire much more powerful than any which the building alone could have caused.

In terms of fuel for spark ignition engines, ethanol or blends of it with gasoline are becoming more and more prevalent. This will have an obvious spin-off in fire fighting at storage situations: foams suitable for hydrocarbons are often not suitable for oxygenated hydrocarbons which require 'alcohol resistant' foams. **IFF**

Reference

1. Jones J.C. 'The Buncefield Oil Depot Explosion' International Fire Fighter February 2006 pp. 49-52.

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By Mark Whitcher

Managing Director,
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For the first time one of the world's leading manufacturers and designers of decontamination technology, is able to offer the fire and emergency services of the world, who form the core of its customer base, a choice of inflatable or reticulated frame decontamination showers for use at chemical spillage incidents.

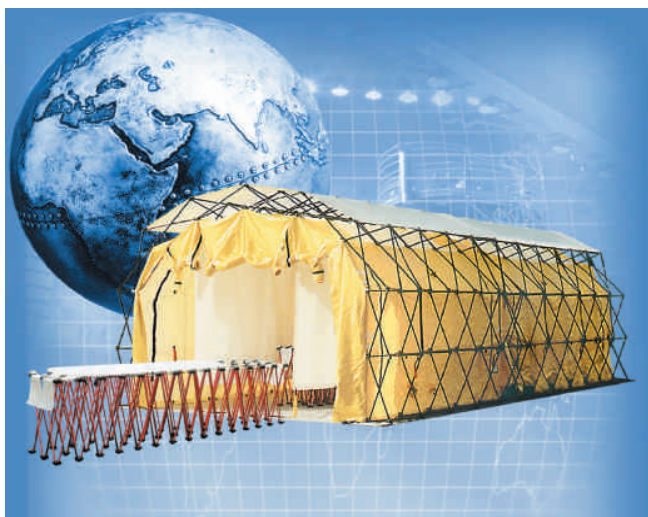
Until now frame technology has been associated only with the largest mass decontamination units. Also these mass units are now available in a hybrid form – as inflatables with all the rigidity of a metal frame product. Add to this new developments in decontaminating foams, for the treatment of entire buildings or vehicles as well as the introduction of the ultimate in personal safety, an individual decontamination escape kit, and some idea of the distance this sector has travelled since my company introduced the first practical inflatable decontamination unit in 1996 becomes clear.

There is no question of the metal frame type replacing the inflatable decontamination shower however, it is rather a question of expanding customer choice. Indeed the inflatable unit remains the choice of the UK's National Health Service. The first inflatable shower was launched for the specific purpose of attendance at chemical spillage and other hazmat incidents to decontaminate both PPE and casualties. Since then it has evolved dramatically, its effectiveness being regularly enhanced by design changes dictated by end-user experience in the field. The great attraction of the inflatable unit is that it provides a highly effective, easily transported and rapidly deployed system for a relatively low price, and is now a familiar sight at incidents world wide from Helsinki to Hong Kong.

Formerly reserved for mass decontamination units the reticulated frame concept is now available designed for hazmat decontamination. Like the bigger units they can be erected and ready for action in as little as two or three minutes by just

two people and without the need for an electricity supply or an inflation device. Their structural integrity is considerable and tests to destruction show that they remain functional even if 30% of the framework is damaged or missing. Even entry level units in this range include an integrated shower requiring no installation plus internal and external contaminant containment and a UV stabilised fire retardant and chemical resistant top canopy to provide natural ambient light. They are manufactured from break and tear resistant material that is also impervious to degradation from extremes of heat and cold, oil or mildew as well as being flame resistant.

The decision to create an inflatable offering the rigidity of a metal structure was made with user budgets in mind. The key feature of the hybrid is a robust inflatable frame made from natural rubber which provides a similar rigidity to the metal frame type. This is covered by a yellow removable reinforced lightweight PVC outer canopy with a lightweight inner liner made from a reinforced PVC material with a PU coating. There was a gap in the market for a unit of this type. People recognise the high performance values of the articulated metal type but some find it rather costly. What is now offered is a design close to metal performance but at a lower price. On one hand the hybrid can handle large numbers of ambulant or non-ambulant casualties, offering undress and redress cells as well as decontamination sections, on the other units for the decontamination of single PPE users. It also has all the deployment characteristics of the metal frame



or conventional inflatables being ready for action in less than two minutes.

One of the latest developments in decontamination is a foam product designed for use on buildings or vehicles. Developed in the US this product known as EasyDECON™DF200 and is capable of killing or neutralising a broad range of WMD contaminants. Also because of its unique chemical structure it can be used on practically anything. The product is particularly suitable for the decontamination of structures as it has the unique ability to adhere to vertical and inverted surfaces where it creates a foam blanket to maintain the required contact time between agent and decontamination formulation. EasyDECON™DF200 has the added virtue of being non-corrosive and its use adds no environmental load to the appropriate clean-up operation. Kill time ranges from a few minutes to half an hour depending on environment and prevailing conditions.

When used with dedicated application equipment even coverage is achieved, maximising contact time and suppressing any reaction from the agent being treated whilst decontamination takes place.

The most obvious major feature of this new system being is that it does not use water. Water has been at the central element in all decontamination technologies until now. Essentially what water does is to move contaminant from one place to another. If its protective clothing or human casualties you are decontaminating the subjects, and the arena of operations are small enough for contaminated water to be contained somewhere and disposed of. But with a vehicle you start to have problems and with a building it becomes just about impossible to use successfully. This product is the answer.

Where a relatively small scale deployment is required a back pack facility is available. This is ideal for use at nuclear power plants, pharma companies, petro-chemical facilities, similar process operations as well as military installations. A fixed site decontamination system is also available to undertake interior and exterior building decontamination, hazmat and fire response, cargo and infrastructure protection and decontamination at airports, seaports, roads and runways, amongst other possibilities. It is not just the macro decontamination problem that has been addressed recently however. On the micro level an individual decontamination escape kit has been developed. Its most innovative feature is a revolutionary decontamination spray that its US developers claims makes the user proof against SARS, Avian Flu, H5N1, Anthrax, Ecoli, Mustard Gas

(HD),Sarin (GB) and Soman (GD) amongst other things. This personal incident decontamination spray besides being highly effective in killing biological and naturalising chemical agents is safe and environmentally friendly. The dispenser consists a three component decontamination fluid which when activated combine and react to neutralise biological and chemical agents. As an example the activate spray registered a 99.99999% kill rate in 30 minutes or less when applied to the Anthrax pathogen which is one of the most difficult to kill. This spray has a two year shelf life.

The rest of the kit consists of a hood style respirator, suit with integral booties, hazmat over-boots and gloves, all enclosed in a hard-sided water tight case or executive holdall. Suit, boots and gloves are

approved for use with WMD agents and the hood complies with military standards. The respirators allow for filtration of particulates down to 0.3 microns with 99.9997% efficiency and each filters lasts for 30 minutes. The kit comes in sizes small to extra large.

Whilst the focus tends to be on the decontamination technology the importance of the correct operative PPE should not be overlooked. What is believed to be the first range of protective suits specifically for decontamination incidents has recently been developed. There are four in the range. The first is designed as an incident control suit, the second is a full decontamination suit, the third is an NBC escape suit and the fourth is for training purposes. The training suit is necessary because the "front line" suits in any decontamination range are, as a matter of necessity, of limited life and it would not be economic to use them in a training situation. The training suit simulates all the wearing characteristics of the others but at a fraction of the price. Made from lightweight PVC and clearly marked "training suit" this unit is a simple one piece with an optically clear PVC visor and a standard non-gas tight zip across the chest. It features an internally worn air blower system.

In recent years, with the growing sophistication of decontamination technologies and the increasing awareness of the threats they are intended to counter great and greater emphasis has been placed on training. Great importance has been placed by major manufacturers like my own company on developing training programmes jointly with the users of their equipment. These include tabletop and group discussion along with practical exercises designed around the individual users specific needs.

A wide range of accessories has also been developed that enables the creation of highly customised full operational systems. The range and choice of accessories has become so sophisticated that my company has set up a special department devoted to sourcing and recommending the most appropriate in terms of both performance and cost terms to the individual customer. The thinking behind this is based on the fact that whether they be managers or practitioners end users have neither the skill or time to act as purchasing experts as well as doing their daytime job. This has to be the job of the manufacturer in an area which is fast becoming, because of the exigency that drives it, a model of end-user- manufacturer co-operation that those in other sectors would envy.

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Typical application to
LPG storage vessels.
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You Better Bleve It!

What Are The Fire Protection Options For LPG Storage Vessels?

**By The Association
for Specialist Fire
Protection (ASFP)**

When sealed vessels of liquefied gases such as bullet tanks or spheres are accidentally exposed to, and enveloped by fire, a BLEVE can occur. The results can be appalling and any person responsible for the fire-proofing of any such structure should be fully aware of what standards exist and what remedies are available.

If BLEVE is a new term to you, it stands for Boiling Liquid Expanding Vapour Explosion. As a vessel's external temperature increases, vapour is generated inside causing the internal pressure to increase rapidly. During this process, the wall temperature rises in the empty part of the tank or sphere, gradually weakening its strength. Eventually the increased internal pressure exceeds the strength of the wall. At this point the vessel will rupture releasing superheated liquid which expands and vaporises in seconds adding further fuel to the fire and resulting in a fireball that is likely to cause catastrophic damage. This can also occur even when a pressure relief valve has been activated to vent the vessel.

In order to reduce the risk of a BLEVE, the vessel's wall temperature must be kept at a certain level, for a set period of time, in order to prevent

rupture and allow the fire to be extinguished.

The UK Health and Safety Executive document HS/G34 'The Storage of LPG at Fixed Installations' provides guidance for the fire protection of horizontal vessels and spheres. The document states 'LPG storage vessels threatened by fire should be kept sufficiently cool to prevent vessel failure. This protection can be achieved by the discharge of water on to the vessels at a rate sufficient to maintain an adequate film of water over the surface of the vessels and supports'. The document also notes that 'vessels may also be protected from radiant heat by burial, mounding, or other methods such as insulating coatings providing an equivalent standard of protection to adequate water drench systems (i.e. monitors or fixed sprays) can be achieved. Where these methods are used, water for fire protection need

Wet applied and cast fire protection to storage vessels carried out for Nexen Petroleum (UK) Ltd. Pic by kind permission of ASFP member Aaronite Services Ltd



not be provided except for the unprotected manholes on underground or mounded vessels'.

Other standards and codes can also apply, notably the American Petroleum Institute publications API 2510, API 2510A and API 2218.

Work carried out by several companies, together with the Health and Safety Executive, has established that the application of 9.8 litres of water, per square metre, per minute, is sufficient to protect a vessel from the effects of a pool fire or the radiant heat from a nearby fire. In the event of a fire, water drench systems are activated either automatically or manually and in view of this, consideration has to be given to the time lag between the fire breaking out and the actual activation of the system.

Water drench systems therefore consume large amounts of water; for example a 23 metre diameter sphere would require approximately 310,000 litres of water per hour, excluding any additional water that might be required to protect any adjacent vessels or structure or for fire fighting. If the fire has spread from a nearby location, there is also the possibility that the water drench system may have already been damaged and thus may not work effectively when activated. Water drench systems require regular maintenance to ensure that piping is in good condition and that nozzles are not blocked, which might lead to insufficient water being applied to some areas of the vessel thus causing 'hot spots' and possibly premature failure in these areas.

Burial or mounding fire protection techniques can also be effective as the fire is unable to engulf the vessel. With this type of fire, however, protection inspection and maintenance of the vessel and its ancillary systems is often difficult. Small leaks, in pipe-work for instance, can prove impossible to detect. Ground water can pose problems for the vessel through corrosion and 'floating', while earth movement may also cause damage.

Passive fire protection products (referred to as insulating coatings in HS/G34), such as those based on cementitious or intumescent technology, can also be used to protect vessels. They offer many benefits; the main one being that the fire protection is not reliant on a system that requires activation either automatically or manually. If properly applied by experienced installers, passive fire protection products require little maintenance and thus their through-life cost is low.

Passive fire protection products for vessel protection, those that follow a hydrocarbon fire time temperature curve, are fire tested to different

standards to their counterparts in the commercial building industry. And they need to be! In hydrocarbon tests fire temperatures of 1100°C are reached within 5 minutes, whereas in cellulosic fire tests (those used for commercial buildings) the temperature will only rise to 500-600°C in the same time period. Hydrocarbon standards/tests include BS476: Part 20; 1987 Appendix D, Underwriters Laboratory 1709, Factory Mutual Standard 'Fire Protection Coatings for LP Gas Steel Storage Vessels and Process Structures' and the Norwegian Petroleum Directorate 'H' Class Test.

In addition to the above tests, many of the hydrocarbon rated passive fire protection products have also been successfully tested and proved to withstand torch fires. Such fires may occur in a hydrocarbon processing facility when a gas line ruptures and causes a high intensity fire to impinge upon a very small area of a vessel or structure. The durability of hydrocarbon rated passive protection products is of a very high level and has been demonstrated both by accelerated testing and by actual installations that date back to the mid 1970s. Explosion testing, has proved that these materials will remain on the substrate and stay in place to withstand any fire that may follow.

In summary, the engineer has a choice when considering how to provide fire protection to LPG vessels, with all systems having their pluses and minuses. Provided they are properly installed and maintained all systems will help to avoid a BLEVE. If in any doubt with regard to design, further advice should be obtained from the relevant Government Agency, Trade Association or manufacturer. **IFF**

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Intumescent moulding technology to provide fire protection to a Rotork electronic valve actuators. Pic by kind permission of ASFP member Fire Protection Coatings Ltd

TRAINING



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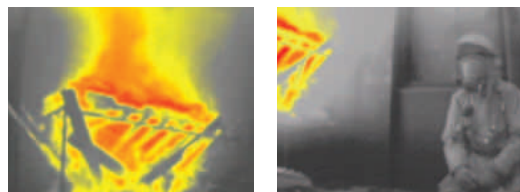
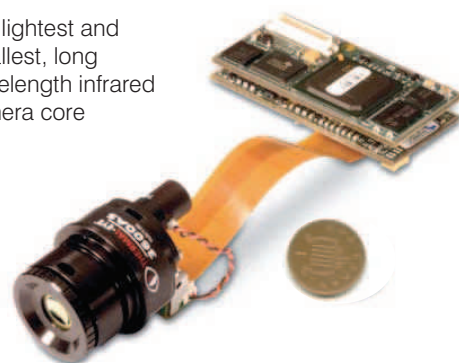
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Don't Learn by Accident

The Importance of Training

Recently, a group of contractors were at a petrochemical facility in the United States. Their portable single gas detectors began to alarm, showing dangerous levels of hydrogen sulphide (H_2S). Knowing that there was no H_2S present in the facility, the contractors continued to work. An eventual investigation into the incident showed that the contractors were being exposed to sulfur dioxide (SO_2). Their detectors were alarming because of the cross-sensitivity reaction of the H_2S sensor to SO_2 .

By Sarah Ursulan

Communications
Coordinator
BW Technologies by
Honeywell

Although none of the contractors perished, the incident could have been potentially deadly. With proper training, the workers would have reacted to the alarm situation without analyzing why their monitors were going into alarm. However, believing that proper training and procedures would be paramount at all facilities would be a complacent misconception. Despite large profits, many companies neglect the training of their workers, contractors and visitors. Inadequate training in all areas of gas detection, can easily lead to serious accidents, even fatalities.

Training is an integral part of safety. Providing a worker with a gas detector and showing them the

area in which they will work is not a recipe for success. Without educating workers on how to properly use all necessary personal protective equipment (PPE), safety training and the importance of procedures, employees and facilities can always be at risk.

Unless you know what to protect yourself from . . .

If you are not aware of the dangers present in the workplace, you cannot protect yourself from them. Education on the theory of gas detection is an important start. Industries that entail confined space entry can be very different from each other,

even though the four most common hazards are oxygen deficiency, hydrogen sulphide, carbon monoxide and methane. For example confined space entry in aircraft fuel tanks presents the danger of jet fuel while in wineries and breweries, the threat of carbon dioxide presents an additional danger. Training workers on the hazards specific to their application and industry increases the safety of staff and the facility.

Understanding the symptoms of exposure is significant after learning which toxic hazards may be present in the work environment. The misconception that hydrogen sulphide (H₂S) always smells like rotten eggs can be potentially deadly. At low concentrations, H₂S does smell of rotten eggs, however at 20 to 30 parts per million (ppm), sense of smell is deadened by paralysing the respiratory centre of the brain and olfactory nerve. If workers are relying on sense of smell to alert them to the danger of H₂S, levels may reach deadly concentrations. With proper training, an understanding of

dures and training were both at fault for the accident. With basic hazard recognition training and portable gas detectors, workers could have been alerted to the dangerous atmosphere. The lack of proper policies and procedure were also to blame.

Rules

The tragedy at the Sullivan Mine illustrates the importance of having strictly enforced policies and procedures that all employees and contractors are made aware of repeatedly. The owners of the mine came under scrutiny for not posting signs alerting staff to the confined space in the shed and for having employees working alone without periodically checking in.

Having all employees, contractors and visitors adhering strictly to the rules and regulations of a facility improves safety, but everyone must be aware of the guidelines. Repetitive training reinforces knowledge of the rules at the facility.

Similarly, being familiar with the NIOSH or

Training on the theory of gas detection also includes the characteristics of toxic hazards. Carbon monoxide is colourless and odourless. Without a gas detector, its presence may go unnoticed until hazardous levels are reached. With a better understanding of gas hazards, the need for safety measures is emphasized.

dangerous ppm levels and their corresponding physiological responses for all gases that potentially are present can be used to assess situations and properly interpret gas detector readings.

Training on the theory of gas detection also includes the characteristics of toxic hazards. Carbon monoxide is colourless and odourless. Without a gas detector, its presence may go unnoticed until hazardous levels are reached. With a better understanding of gas hazards, the need for safety measures is emphasized.

Similarly, exploring the causes of potentially deadly atmospheric hazards is a fundamental part of gas detection theory. Oxygen deficiency is a concern during confined space entry, and causes can include displacement, microbial action, oxidation and combustion.

In May 2006, a contractor, Doug Erickson, entered a shed built above a water pit to collect drainage water for sampling at the decommissioned Sullivan Mine in B.C., Canada. Low oxygen air had been seeping into the sump from a drainage pipe creating an oxygen deficient atmosphere. Doug Erickson succumbed, but was in the shed for two days until another contractor, who was also working alone, attempted to locate him. That employee and two paramedics who later entered the shed also succumbed. Issues and shortcomings in proce-

dures and training were both at fault for the accident. With basic hazard recognition training and portable gas detectors, workers could have been alerted to the dangerous atmosphere. The lack of proper policies and procedure were also to blame.

More Training?

Training specific to certain industries and applications is often available. Confined space training is available to increase awareness of potential dangers. Upon completion, participants are able to identify confined spaces and understand the associated hazards. Additional courses may cover proper entry procedures, how to operate within the confined space and utilizing appropriate personal protective equipment (PPE). Any employees who may have to make a rescue from a confined space can take special courses usually including simulated rescues.

After completion of gas detection theory, procedural orientation for the facility, and confined space training or other courses applicable to your work environment, it is important to know how to properly use your personal protective equipment (PPE). PPE may vary between facilities, industries and applications, and can include fall, hearing, foot, eye and respiratory protection in addition to a gas monitor. Understanding what a portable gas detector can do and what it cannot do allows workers to maximize their protection.

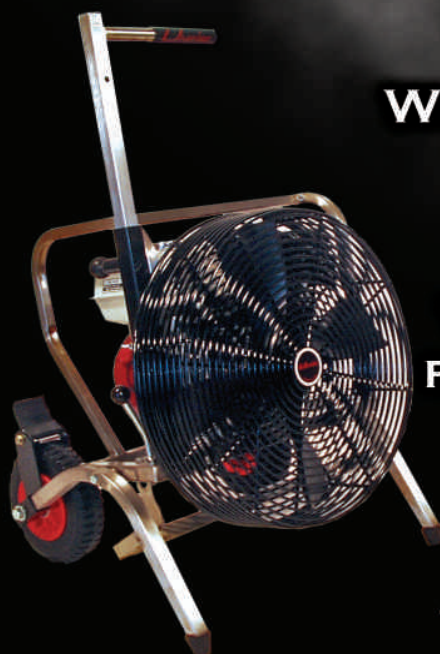
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Back to Basics

Every gas detector comes with a manual that explains the standard parts of the monitor (including sensors and batteries), activating and deactivating the detector and how to attach accessories. Comprehension of a detector's abilities allows the user to maximize its efficiency. Always read and continue to review the manual that comes with your personal protective equipment.

User options allow the customization of the detector to suit certain applications and situations. With multi-language support, workers can understand the information that the device is providing. A passcode protect function may be equally useful in preventing unauthorized access once the detector is used in the field. Without adequate training, these user options may not be properly utilized leading to potentially deadly situations. If a worker cannot understand the information provided by the detector, they may be put at significant risk.

Cleaning and caring for a gas detection device properly also allows for maximum efficiency. Cer-

erly between calibration intervals. Today recommended calibration intervals vary, but there is unanimous agreement amongst manufacturers that verifying the function of portable safety gas detectors between calibrations is necessary. Since many users do not understand why functional bump testing is necessary, the practice is often not adopted. In some areas of the world functional bump testing personal gas detectors between calibration intervals is virtually unheard of. Training on all aspects of gas detection will help create an awareness in these countries.

Photoionization detector sensors can suffer a loss of sensitivity if internal components such as the ultraviolet lamp or sensing electrodes become dirty through everyday use. Performing a functional bump test with a known concentration of gas will enable the user to determine if the PID is responding properly.

Even though the gas detector performs diagnostic checks at start up and during operation it is often not possible to detect a problem with sensor

Photoionization detector sensors can suffer a loss of sensitivity if internal components such as the ultraviolet lamp or sensing electrodes become dirty through everyday use. Performing a functional bump test with a known concentration of gas will enable the user to determine if the PID is responding properly.

tain solvents, citrus, alcohol or silicone based products, soaps or polishers should not be used to clean the exterior of detectors. Choose the manufacturer recommended cleaner in order to ensure the sensors and detector are not being damaged.

Proper maintenance of a gas detector goes beyond cleaning. Calibration and bump testing is an important part of ensuring that a detector is functioning properly.

While calibration adjusts sensor accuracy, between calibrations the only way to confirm that a gas detector is functioning properly and is capable of responding to gas is to expose the instrument to a concentration of target gas high enough to initiate an alarm situation while the instrument is in operating mode in a fresh air environment. This procedure is often referred to as a functional bump test.

In the evolution of safety gas detection instrumentation, functional bump testing is a relatively new practice. There was a time when calibration was recommended frequently, even daily, but as sensor technology and sensor performance became better understood, the frequency began to lengthen. As calibration frequency decreased it was just assumed a detector was operating prop-

erly. For example, the detector can not warn users that sensor ports are obstructed by dirt, oil, or some other substance, the capillary pore of an oxygen sensor is blocked, or the catalytic bead of a combustible sensor has been poisoned. Either way, if gas is not able to reach the gas detector sensor, the sensor is not able to detect its presence.

In addition to training through the use of manuals, many gas detector manufacturers and distributors offer training sessions that are specific to certain industries and applications. Interactive training CDs are produced by some companies and can be a useful training tool.

Reinforcement

Continued education is important to reinforce what is learned during:

- Gas detection theory
- Facility rules, regulations and procedure
- Gas detector training

Without repeated training sessions, complacency can set in. Training on atmospheric hazards and how to safely work in potentially dangerous environments is imperative to the safety of both the employees and facility. Above all, training should never be neglected.

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Fire Control Technique

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In the fire service one of the key responsibilities of a fire department or response agency whether Municipal or Industrial based is fire control. Fire control does not only start once a fire has occurred but should also be a part of fire prevention measures taken prior to a fire occurrence. This area of fire control is most important due to the importance of prevention in loss of lives and property. If we can install control techniques and instill fire prevention knowledge during the pre-fire occurrence phase, then the control techniques needed during a fire will be much safer, easier and more efficient.

By Robert Moore

Texas Engineering
Extension Service (TEEX)

There are many types of fire control techniques used in today's fire service. These techniques are as different as the periods of firefighter evolution in which they are used. In this article we will discuss these periods and the techniques used.

There are 3 distinct phases or periods of fire control. These are the pre-fire occurrence phase, the fire occurrence phase and post-fire occurrence phase. As stated earlier the most important period in fire control is during the pre-fire occurrence phase or prevention phase. Let us examine each phase and the control techniques associated.

Pre-fire Occurrence Phase

Pre-fire occurrence is just what it says. It is the period prior to the occurrence of a fire ignition. During this period there are many fire control techniques that should be established. Without this phase the fire incident rates in the world would be tremendous. The fire control techniques during this phase encompass design through planning,

detection and maintenance. Here are a few of the most important pre-fire phase controls.

- **Design**

The design of what ever is being built is a key element in fire control. Buildings and structures can be designed in ways that will prevent fire spread from one compartment or room to another simply by construction methods. Things such as fire barriers in walls, floors, and ceilings are optimal in this aspect.

Using fire proof materials in construction is another important factor in fire control. Today there are many materials being used that will prevent or deter fire spread in buildings and structures.

- **Pre-Plans**

Pre-plans are a fire control technique that is often overlooked. By pre-planning a structure or industrial facility you will have the knowledge and tools to slow or stop flame spread faster and safer. Municipal firefighters have

es: The What and How

used pre-plans for many years to understand types of occupancies, building fire loads, layouts, locations of entry and egress, material storages, and response routes. All of which are very important in fire control. The Industrial sector is now utilizing pre-plans to assist them in faster control during fire emergencies. The Industrial firefighter is interested in the same information as the Municipal firefighter. They are also looking more intensely at the fire load due to the many different types of chemicals, gasses, and solvents used in their industry.

- **Detection**

There are many different types of detection available today, smoke detectors, rate of rise heat detectors, ionizing and non-ionizing, monitored, and non-monitored. No matter what type is used, these are one of the most important aspects for life safety. As a fire control technique, they are invaluable to response times which are an important key to fire control.

Fire Occurrence Phase

Of course during this phase we already have fire ignition and the firefighters have responded and are on the scene. They are in the process of setting up the infamous hose lines to apply water and extinguish the fire. Fire control does not only mean extinguishment. There are techniques that can be incorporated prior to the application of water that will help control the fire spread and limit the destruction while protecting occupants.

- **Ventilation**

Not only is the ventilation technique an excellent tool for firefighter safety, it can be invaluable in controlling the fire spread. By creating an opening above the fire compartment (the area that is burning) and creating openings in the lower levels of the unburned areas of a structure this will allow the heat load from the fire to rise and vent out of the structure above the fire compartment which will create a draft and assist in containing the fire in one area. Of course if not properly applied the ventilation technique can cause the fire to spread to unburned portions of the structure.

- **Hose Line Attack**

The use of water has been a staple in the fire service. Of course everyone knows that water can be used to extinguish a fire. Water is also an excellent method to control fire spread. By applying water to exposed structure the fire service can prevent fire from extending outside the fire compartment that already exists. The cooling affect of the water will not allow new fuel areas to ignite. As with ventilation, improper use of the hose line attack can aid in spreading the fire to other areas by pushing the fire outside the existing fire compartment. When using the hose line attack, the firefighter should always attack the fire in a direction that will push the fire towards existing burned areas of a structure. This will prevent fire spread to new fuel areas and hopefully prevent unnecessary water damage to the rest of the structure.



Pic courtesy of TEEX

- **CAFS (Compressed Air Foam) Units**

Fire fighting foams have been used in industrial fire fighting for many years. The Municipal fire service has primarily used foam in industrial applications and automobile fires. With the advent of the CAFS unit the more municipal departments are using foam inside burning structures. The CAFS unit creates a viscous high expansion foam, using a small amount of water. This allows the foam to fill a fire compartment cooling the area and preventing oxygen from getting to the fire thus causing the fire to die. We all remember the old fire triangle, heat, fuel, and oxygen – take one element away and the fire will go out. The CAFS unit has allowed firefighter to use foam without a large amount of water damage.

Post-fire Occurrence Phase

The post-fire occurrence phase is the period after fire extinguishment and the fire department leaves the scene. Too many times, as firefighters, we get into big a hurry to leave the fire scene once the fire has been “extinguished”. This is when we get the classic rekindle or reignition. I personally do not believe there is such a thing as rekindle. If the fire reoccurs then we did not do our job and put it out the first time.

- **Utility Disconnect**

When discussing utility disconnect we are referring to electrical and natural gas. By ensuring these are totally disconnected from the

Pic courtesy of TEEX



structure it will help ensure that there is not an added ignition source. These should be disconnected by the service provider or by qualified personnel.

● Overhaul

Overhaul is probably the most important fire control technique during the post-fire occurrence phase. Overhaul starts once the initial fire has been extinguished. Proper overhaul will ensure that all fire and smoldering material has been extinguished or removed from the structure. This will prevent reignition and an unnecessary trip back to the scene.

What we have discussed have been basic fire control techniques. There are many ways to control a fire which brings us to the most important technique of all – **Training**. Training of firefighters is the essential element in choosing the proper technique used on the scene. Without proper training firefighters will possibly create unnecessary fire spread. Training should start with a good basic Recruit Academy and continue for the remainder of their careers. Continuing education conducted at least annually will allow firefighters to enhance their ability to be more effective when on scene.

Training Service Providers

Regardless of whom you select as a training provider you need to ensure that a few fundamental needs are met. You should start by looking at the safety aspects of the facility. I am not only talking about do they train safely, but what is the condition of their facility and is it being maintained in a manner that would promote safety for your team. The second item to consider is what type of accreditation, certification, or professional credibility does your training provider offer. You

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need to ensure yourself that your training provider is not some “fly by night” outfit that will be here today and gone tomorrow. No matter how good your training records are there is always that possibility you will need to go to your service provider for records or proof of training. You must ask yourself is my service provider going to be in business next year or even ten years from now. If you take these and other related items into consideration prior to training you could save yourself some potential headaches down the road.

The Brayton Fire Training Field builds upon a long legacy of TEEX's fire training services. In 1929, the State Firemen's and Fire Marshal's Association of Texas selected Texas A&M for a

When selecting fire training service providers it is critical to measure how the training will be carried out and if the service provider can meet your unique needs.

permanent fire school, with the first annual school a year later attracting 196 firefighters from 76 Texas cities and towns for two days of drills and ground practice. The success of the first school prompted the Texas Legislature to officially recognize the A&M fire school as an “imperative public necessity” in 1931. Under direction of Col. H.R. Brayton, a chemistry professor, the annual fire training schools quickly outgrew the A&M campus and nearby Hensel Park in College Station. In 1960, TEEX took 26 acres of dusty scrub brush west of the A&M campus and constructed the present Brayton Fire Training Field. The 1960s saw unprecedented demand for TEEX's firefighter training, particularly for industrial brigades and Spanish-speaking firefighters.

During the 1970s and '80s, TEEX experienced new records in annual school enrollment as Brayton quadrupled in size to its current 120 acres. Today, full-scale props ranging from aircraft fuselages to oil refineries, unsurpassed training and premier instructors combine at the Brayton Fire Training Field to form the world's largest and most comprehensive institute for emergency response training. The combination of the selection of various props and NFPA ProBoard certification classes fits into the category of a “qualified” service provider.


Summary

It is ultimately your decision on how you will plan, respond and recover from an incident. There are a multitude of training providers that can help you to established response protocols and give you the baseline knowledge that you will need to cope with fire. When selecting fire training service providers it is critical to measure how the training will be carried out and if the service provider can meet your unique needs. The impact of this training could prove to be the difference in you having a small controllable incident or making the 5 o'clock news.

IFF

Robert Moore is currently the Private Sector Program Manager for the Texas Engineering Extension Service (TEEX) – The Texas A&M University System. Prior to TEEX, Robert worked for Arco Chemical Company for 21 years in fire and safety and served as the Fire Chief. Robert was one of the 15 specialists in the Channel Industries Mutual Aid (CIMA) group in Houston which covers the Houston ship channel and adjoining industrial area. He is a member of the ASSE and is a Certified Safety Professional (CSP) and holds certification as a Certified Fire Protection Specialist (CFPS).


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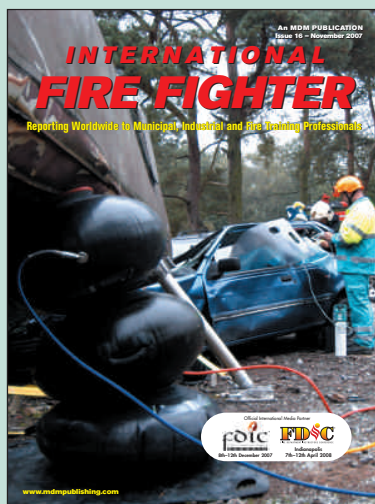
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